U.S. DEPARTMENT OF COMMERCE
National Technical Information Service
PB-277 840

A National Environmental/Energy Workforce Assessment. Colorado

National Field Research Center, Inc, Iowa City, Iowa

Prepared for

Environmental Protection Agency, Washington, D C

Dec 77

PB 277 840

A National Environmental/Energy Workforce Assessment

REPRODUCED BY
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INFORMATION SERVICE
U. S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA. 22161

Conducted by:

National Field Research Center, Inc.

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TECHNICAL REPORT DATA
(Please read Instructions on the reverse before completing)

1. REPORT NO.	2.	3. RECIPIENT'S ACCESSION NO. PB277840
4. TITLE AND SUBTITLE A NATIONAL ENVIRONMENTAL/ENERGY WORKFORCE ASSESSMENT, Colorado		5. REPORT DATE December 1977 - Date of Completion 6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S) National Field Research Center, Inc.		8. PERFORMING ORGANIZATION REPORT NO.
9. PERFORMING ORGANIZATION NAME AND ADDRESS National Field Research Center, Inc. P.O. Box 287 Iowa City, Iowa 52240		10. PROGRAM ELEMENT NO. 2BC651 (36) 11. CONTRACT/GRANT NO. Grant #T900591010
12. SPONSORING AGENCY NAME AND ADDRESS U.S. Environmental Protection Agency Office of Federal Activities (A-104) 401 M Street, S.W. Washington, D.C. 20460		13. TYPE OF REPORT AND PERIOD COVERED Phase I Final Report 14. SPONSORING AGENCY CODE

15. SUPPLEMENTARY NOTES Phase II will comprise approximately five volumes and will be available in September 1978. Phase III will be available in September 1979.

16. ABSTRACT

This study is one of 70 volumes assessing the workforce needs (manpower needs) for pollution control and abatement in the United States for the five-year period of 1976 through 1981. Seven fields for pollution control — air, noise, pesticides, potable water, radiation, solid waste, and wastewater — are analyzed, together with energy-related programs currently accentuated by the national effort to solve energy supply problems.

Designed as Phase I of a three-phase program, the complete assessment includes the following volumes: one each for the 50 states, the District of Columbia, Puerto Rico, and the Virgin Islands; one for each of the ten EPA regions; a one-volume National Abstract; a volume on National Legislation; a volume on Business and Industry; and a four-volume National Summary. The information was gathered through extensive personal interviews with responsible federal, state, and local officials in every state; with officials of representative private industrial and commercial firms; and with representatives of national industrial and trade organizations.

Phase II will develop a broad national inventory of the entire range of post-secondary and higher education training offered in the pollution control and energy areas cited above, and Phase III will offer demonstrations for curriculum changes or modifications which appear necessary to assure an adequate and properly trained national environmental/energy workforce.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS		b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Planning	Employment	National Environmental/Energy Workforce Assessment	
Regional Planning	Economic Surveys		
State Planning	Energy Management		
State Agencies	Pollution Control		
Federal Government Planning	Environmental Management		
	Environmental Education		
Labor Force	Environmental Sciences		
Manpower	Conservation		
Forecasting	Environment		

18. DISTRIBUTION STATEMENT	19. SECURITY CLASS (This Report)	21. NO. OF PAGES
Release Unlimited	20. SECURITY CLASS (This page)	118 22. PRICE PC A06 MF A01

Form 2220-1 (9-73)

NATIONAL ENVIRONMENTAL/ENERGY

WORKFORCE ASSESSMENT

for

COLORADO

Conducted by:

NATIONAL FIELD RESEARCH CENTER, INC

Under Grant from:

UNITED STATES

ENVIRONMENTAL PROTECTION AGENCY

Grant #T900591010

1977

This document has been reviewed by the Environmental Protection Agency and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Environmental Protection Agency, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

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ACKNOWLEDGEMENT

This report was researched and developed under the guidance of the U. S. Environmental Protection Agency Region VIII. The State of Colorado materials were developed under the auspices of the following:

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Special technical assistance and cooperation were extended by numerous individuals: Mr. Ronald Turner, Colorado Department of Agriculture; and Mr. Orvill Stoddard, Mr. Otto Havens, Mr. Frank Rozich, Mr. A.J. Hazle, Mr. Bell Evans, Mr. Ralph Leiholdt, Mr. Brian Iler, and Mr. Bruce Berger of the Department of Health.

PREFACE

The research and development of the NATIONAL ENVIRONMENTAL/ENERGY WORKFORCE ASSESSMENT project was conducted under the aegis of the U.S. Environmental Protection Agency by the National Field Research Center, Inc., Iowa City, Iowa, and the Denver Regional Office. This report is an assessment of the State of Colorado and is one of six state reports within Federal Region VIII.

The State of Colorado Report presents an overview of the current workforce, projections of workforce requirements (1976-1981), training and certification, and career potential in environmental pollution control and abatement. The environmental areas depicted within this report are: air, noise, potable water, pesticides, solid waste, wastewater, radiation, and energy conservation/conversion.

FOREWORD

This state report is a product of Phase I of the NATIONAL ENVIRONMENTAL/ENERGY WORKFORCE ASSESSMENT project in Colorado. The information contained within this report was obtained by extensive on-site interviews and research of project related materials. The information retrieval was conducted through representative federal, state, and when time allowed, local agencies. Telephone and written surveys were utilized as a secondary research source.

Data which are not documented herein are representative of the best professional judgements of experts currently working in the field.

This study is designed specifically for use as a reference tool at the federal regional level as well as at the state level. It is anticipated that the people of the State of Colorado will be the beneficiaries of this endeavor.

National Environmental Energy Workforce Assessment

Phase I

COLORADO

State Summary

I. AIR

The outstanding environmental pollution problem in the State of Colorado is air quality degradation. The state has been divided into eight Air Quality Control Regions (AQCR). Priorities have been assigned for the control of each major pollutant in each of the AQCR's. Pollutant priorities determine the amount and type of control and abatement program emphasis allocated to each region.

Primary responsibility for air pollution control is assigned to the Air Pollution Control Commission, and program implementation has been delegated to the Colorado Health Department, Air Pollution Control Division.

Colorado's air quality program will increase staff over the next three to five years. This increase may be in the form of departmental interdivisional transfers. However, air quality is a priority item in the state and among the citizenry, and substantial cutbacks in this workforce are unlikely. The number of air quality personnel across the state in the local and especially in the industrial sector should increase at a four to seven percent per annum rate. Positions will be primarily at the degreed levels. Increased regulatory activities could diversify opportunities, and there may develop a substantial need for individuals trained in short-term technical courses provided by state, federal, or vocational programs.

II. NOISE

Although the Colorado Department of Health has been identified as the lead state agency for noise pollution control and abatement, the state law also assigns responsibility for noise to the counties and, specifically, to the municipalities. Standards for environmental noise have been established by the state legislature, and twelve municipalities across the state have established regulations.

The Occupational and Radiological Health Division of the Department of Health currently has three persons assigned to environmental noise control. Estimates have been made that approximately fifteen persons are occupationally involved in noise control across the state.

Professionals in the field have estimated minimal increases in the workforce in the area of noise control. At the state level, as well as the local level, increases are not anticipated to exceed five percent per annum.

Currently, there is little evidence that a significant number of career opportunities will develop over the next three to five years. This may be credited to the fact that environmental noise pollution control has not as yet developed as a distinct professional area. Currently, there is very little interest in the field. Environmental engineers and health physicists in both the public and private sector will be required for the limited number of openings which are anticipated.

III. PESTICIDES

Colorado, as an agricultural state, has designated the Department of Agriculture, Plant Industry Division, as the lead pesticide agency. Division personnel number approximately 10; the commercial applicators are estimated at 2,763; and the private applicators, composed for the most part of farmers and ranchers, number approximately 17, 500.

The state staff may experience an estimated per annum increase of approximately four percent while the commercial applicators are anticipated to experience a per annum increase of approximately two percent. Private applicators, on the other hand, will experience a slight decline.

There has been a slight decrease in the number of firms licensed to do structural work in Colorado. Other areas of decline include aerial operators, licensed ground applicators, and pieces of equipment used. Within the state, the number of companies registering products also is declining. Employment opportunities should be available, however, over the next three years,but these career options may be limited.

The state has an ongoing Integrated Pest Management Program (IPM). This program began as a single purpose program in order to produce the Oriental Fruit Moth. Today, parasites are produced to assist in Thistle, Alfalfa Weevil and Dutch Elm Disease control.

IV. POTABLE WATER

Colorado is experiencing rapid growth in some metropolitan areas due to in-migration, and energy development has affected several communities. Expansion of cities and industrial growth have placed an increasing strain on water supplies. Water quantity will remain a problem for some time.

The Colorado Department of Health, Water Quality Control and Public Health Engineering Division, has been identified as the lead agency. Workforce increases are anticipated; the state level may demonstrate an average 5 percent per annum increase over the next three to five years, while the operator category growth is projected to average 6 to 12 percent per annum.

Career opportunities will be available to non-degreed personnel at the operator level. The Department of Health personnel estimate that there will be substantial increases in the number of water supplies, thereby creating openings for operators. At the degreed level, there will be career opportunities for engineers, biologists, and chemists. The following positions should be available over the next three to five years: chemical engineer, industrial hygienist, sanitary engineer, and laboratory personnel.

The growth and expansion of Colorado's cities and the proliferation of industry has and will continue to place even greater responsibility on the state to maintain the purity of drinking water, the life blood of the state.

V. RADIATION

Within the borders of the State of Colorado are numerous sources of natural and man-made radiation. The Legislature has charged the Colorado Department of Health, Occupation, and Radiological Health Division with the responsibility for assuring that occupational exposure, environmental contamination, and public exposure to radiation is kept at as low a level as practicable. The Department has an extensive registration and inspection program for medicine, industry, and research. There are approximately 38 persons occupationally involved in radiation control employed by the state and about 5,260 persons across the state who are employed in radiation related activities.

State level personnel requirements are expected to increase at approximately 2 percent per annum, while the private sector and other non-state personnel requirements are anticipated to increase at an average 4 to 6 percent per annum rate.

Career potential appears to be good in the area of radiation control. Emphasis on nuclear energy is generating personnel needs that require expertise in engineering, science, and technology. Health physicists should have job opportunities.

Radiation use will probably continue to proliferate in Colorado. Mining, milling,and nuclear generating endeavors within the state will present new and varied challenges to personnel involved in radiation control.

VI. SOLID WASTE

The primary responsibility for solid waste management in Colorado has been allocated to the Department of Health, Engineering Division, which has recently been consolidated with the Water Division. It is the responsibility of this Solid Waste Management Section, under the Solid Waste Act, to regulate and control solid waste sites and facilities.

Solid waste management personnel wil increase over the next three to five years across the state. At the state level, a growth rate of approximately 15 percent per annum is anticipated. With new solid waste management legislation, however, these estimates could increase four to five times. An average of 10 to 12 percent per annum increase in operating and supervisory personnel should occur statewide.

One major thrust of the Colorado solid waste management program consists of an ongoing effort directed toward the preparation of an inventory of hazardous waste sources. A second major endeavor of the program involves the closing or conversion of sites which currently are not in compliance. Presently, there are 250 sites within the state, and 60 percent of these are in compliance.

Hazardous materials and toxic substances are presently stored on home-sites or disposed of outside the state. Increased challenges will emerge in the program as problems involving such substances are addressed.

VII. WASTEWATER

The Colorado Water Quality Control Act is administered through the Colorado Department of Health, Water Quality Control and Public Health Engineering Division. There is also a Water Quality Control Commission.

Approximately 1,019 persons across the state are involved in the area of wastewater control. The wastewater operator turnover rate has been estimated to be as high as 65 percent. The workforce allocated to this environmental control area is forecast to increase over the next three to five years. State level personnel requirements should increase approximately 2 percent per annum, and operating personnel requirements will increase at a per annum rate of approximately 7 to 13 percent.

There are a number of skill areas and degreed positions which are presently accessible to those entering the field. Automation will certainly have its effect, and all indications point to a gradual expansion of the wastewater control field.

The potential for careers will depend on fiscal commitment to future needs and on regulations which will establish standards for treatment facilities. The advent of increased strip mining activities will have further effects overall. In the professional, degreed areas, there will be a continuing but gradual expansion of workforce requirements for individuals in the sciences and engineering.

VIII. ENERGY

The State of Colorado has an abundance of wide seamed, low sulfur coal, and the largest contained oil shale area in the world lies under Colorado and surrounding states. Uranium deposits are substantial. Energy resources in most forms are abundant across the state. These resources result in vast economic benefits, but tapping them may generate environmental disruptions. Pollution control and abatement activities related to the development of energy resources is not a new undertaking within Colorado. While development of resources at once with protection of Colorado's environment seem to represent divergent points of view, a spirit of conciliation and cooperation is demonstrated.

The following energy related problems have been identified: conservation, the depletion of fossil fuels, alternative energy sources, mass transportation, and needs for changes in life style and philosophy on the part of the citizenry regarding energy.

There are two major agencies with designated responsibilities in the area of state energy activities in Colorado. These agencies are: the Governor's Energy Policy Council and the Colorado Energy Research Institute (CERI). The number of energy related personnel involved in pollution control and abatement activities statewide is not available at present. Increases will occur, however, in the statewide workforce to 1982.

STATE OF COLORADO - SUMMARY

National Environmental/Energy Workforce Assessment
Pollution Control & Abatement Personnel
Projected Workforce Requirements (1976-1981)
(estimated)

Environmental Area	1976	1977	1978	1979	1980	1981	%/annum growth (average)
AIR	137	144	151	159	167	175	5%
NOISE	18	19	20	21	22	22	4%
PESTICIDES[1]	2,775	2,831	2,888	2,946	3,005	3,065	2%
POTABLE WATER	1,482	1,601	1,729	1,867	2,016	2,177	8%
RADIATION	5,300	5,512	5,732	5,961	6,199	6,447	4%
SOLID WASTE	247	272	299	328	361	397	10%
WASTEWATER	1,019	1,080	1,145	1,214	1,287	1,364	6%
ENERGY	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TOTALS	10,978	11,459	11,964	12,496	13,057	13,647	4%

[1]Does not include private applicators.

EDUCATION

In the State of Colorado there are several institutions which offer degrees in environmental programs. A larger number of higher education institutions offer environmentally related courses which are not directed to a specific degree.

Colorado State University at Fort Collins presents an interdisciplinary studies program in general environmental studies. This program allows students to concentrate electives from a list of approved courses emphasizing environmental issues and alternative problem solutions. This program does not lead to a degree. The courses, however, can be used in meeting the requirements for a Bachelor's degree.

The University of Northern Colorado at Greeley historically has emphasized the preparation of students for careers in education. The University offers 31 hours of intensive environmental studies representing an interdisciplinary approach to complex environmental problems. The courses are utilized as electives to the general educational curriculum requirements.

Environmental education is well represented at Colorado's institutions of higher education. In the State Report, programs are described including Adams State University and the Community College of Denver at Red Rocks. These two institututions are presented as representative of environmentally related educational offerings in Colorado.

LEGISLATION

The environmental/energy legislation for Colorado was obtained by request from various agency personnel and through various library references. Summaries of the legislation deemed most relevant to the eight subject areas of the workforce assessment were prepared and are included in the respective state reports. The following list of laws represents virtually all environmental legislation for the state. Only certain of the following laws were summarized; the list is presented to show, by title, the kinds of laws which have been enacted.

Air Pollution Control Act of 1970

Noise Abatement Law

Commercial Pesticide Applicators Act

Pesticide Act

Water and Waste Water Treatment Plant Operators Law

Radiation Control Law

Solid Wastes Disposal Sites and Facilities Law

Individual Sewage Disposal Systems Act

Water Quality Control Act

National Environmental Energy Workforce Assessment

Phase I

COLORADO

State Report

STATE PROFILE

Colorado is world known for its dramatic history. 104,247 square miles, highest above sea level of any of the states, Colorado is eighth in total land area.

The written history of the state began with the coming of the Spaniards from Mexico in the sixteenth century. Cheyenne, Arapahoe, and Ute nomadic Indians roamed the plains. The Utes indulged in sporadic warfare with the white men until the Meeker massacre in 1879. Today, the Utes occupy the southwestern area of the state. The history of the Utes is of great importance to the state. One of their great leaders, Ouray, presently adorns the state capitol along with fifteen other historical figures who are depicted in stained glass.

The Cheyenne and Arapahoe roamed the eastern plains and warred with wagon trains and stage coaches. By 1869, due to a final conflict at Summit Springs, the Plains Indians of Colorado ceased further warring with the whiteman.

Spanish explorers lead by the 16th century knight in armour, Coronado, traveled north to Colorado in search of gold. But they did not find it. Failing in their search for gold, the Spaniards did not occupy the area.

French fur traders traveled through the region in the eighteenth century. They too, did not stay. It was not until the beginning of the nineteenth century that the Americans appeared. The first official

explorer was the famous Captain Zebulon Pike. Trappers and fur hunters followed the streams into the secluded mountains in an effort to find beaver. When beaver prices declined, these men took up the buffalo robe trade. During this time, the famous Colonial, Kit Carson, commanded the military Fort Garland in the San Luis Valley.

But the extensive settlements sprang up as a result of mining. Surviving her early ordeals, Colorado entered the Union in 1876 and was called, as today, the "Centennial State" in honor of the signing of the Declaration of Independence.

In 1870, the population was 39,864. Today 2,209,528 people are located mostly in the metropolitan area of Denver and along the Front Range of the Rockies.

Gold, silver, copper, lead, uranium,and vast coal and oil shale reserves contribute to Colorado's wealth of natural resources.

Colorado is a major area of importance in the atomic age. In 1951, the Atomic Energy Commission built a production facility at Rocky Flats. The North American Air Defense Command (NORAD), the first two-country military command to operate on the North American continent, is housed at Colorado Springs. Colorado contributes to space development at the High Altitude Laboratory, the highest permanent laboratory in the Northern Hemisphere.

The most imaginative of the old fur trappers, Indian scouts, cattle kings, and miners could not have envisioned the Colorado of today. Exploration and research are of a different variety. Gone today are the colorfully dressed Arapahoe and Cheyenne, racing across

the plains on their beloved Pintos and Appaloosa. But the newcomers who have taken their place are filled with a spirit of adventure. Gone, in reality, are the covered wagons of the early settlers. But very alive today in Colorado is the heritage which one generation of frontiersmen leaves to the next.

POLLUTION CONTROL AND ABATEMENT AGENCIES

The following agencies are those which are involved with environmental programs within the state. Each narrative provides a review of the functions and activities of each agency as they relate to environmental programs.

COLORADO DEPARTMENT OF HEALTH

Since territorial days, the people of Colorado have had their health protected. The forerunner to the present Department of Health was established by the Colorado Territorial Government and was called Board of Health. Even one hundred years ago the people were sufficiently concerned about natural phenomena to indicate their concern regarding the climate. The late Dr. Florence R. Sabin was the main thrust behind the Reorganization Act of 1947. In 1970, other reforms were added regarding county health units.

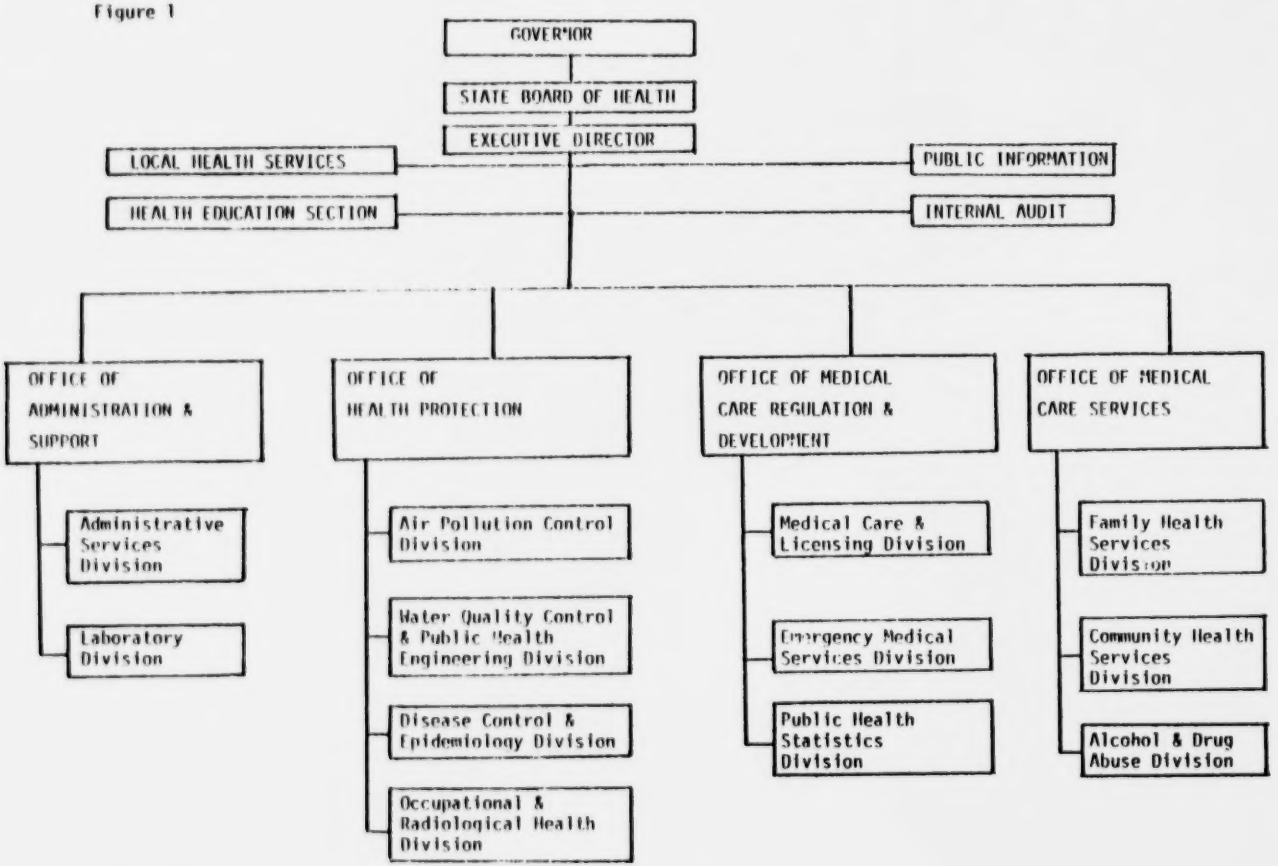
The range and scope of the Department responsibilities have grown many times over since the early frontier and territorial days. Today the Department administers 25 major programs, and has a budget in excess of $80 million, (33 percent federal). The Department maintains close liaison and cooperation with the 13 local health units and 41 county boards.

Presently the Department maintains a staff of over 600 persons, representing 143 job classifications. The Department functions through twelve divisions and 34 sections. There are ten commissions, committees, councils, and registration/examination boards which have an input into the responsibilities and programs of the Department.

The four major areas that administer the twelve divisions are: Administration and Support, Health Protection, Medical Care Regulation and Development, and the Medical Care Services. Environmental Health comes under Health Protection. An overall organizational chart follows.

C O L O R A D O - STATE DEPARTMENT OF HEALTH

Figure 1


GOVERNOR
STATE BOARD OF HEALTH
EXECUTIVE DIRECTOR
LOCAL HEALTH SERVICES
HEALTH EDUCATION SECTION
PUBLIC INFORMATION
INTERNAL AUDIT
OFFICE OF ADMINISTRATION & SUPPORT
Administrative Services Division
Laboratory Division
OFFICE OF HEALTH PROTECTION
Air Pollution Control Division
Water Quality Control & Public Health Engineering Division
Disease Control & Epidemiology Division
Occupational & Radiological Health Division
OFFICE OF MEDICAL CARE REGULATION & DEVELOPMENT
Medical Care & Licensing Division
Emergency Medical Services Division
Public Health Statistics Division
OFFICE OF MEDICAL CARE SERVICES
Family Health Services Division
Community Health Services Division
Alcohol & Drug Abuse Division

COLORADO DEPARTMENT OF AGRICULTURE

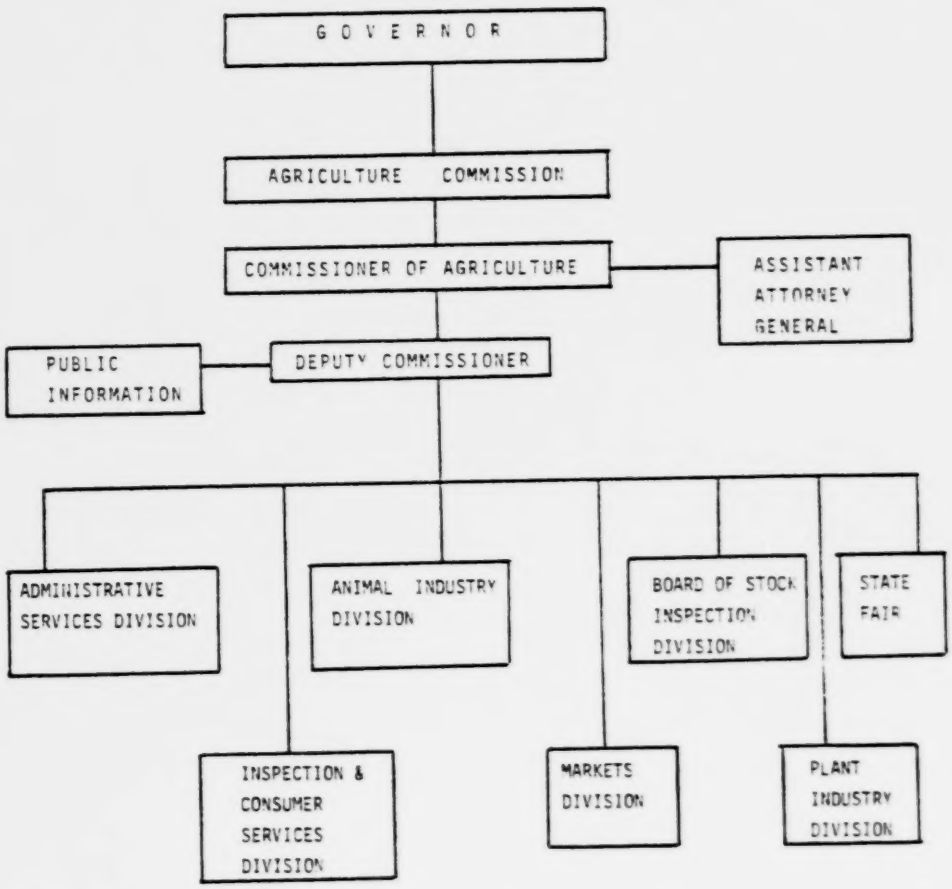
In 1949, the state Legislature of Colorado created the Department of Agriculture. Before 1949, many of the functions of the Department were carried out by other state agencies. With the creation of the department, responsibilities were allocated to four divisions. Today these four have grown to seven. The primary responsibilities of the Department are found in the 1963 Colorado Revised Statutes, section 6-1-4. Included among the major responsibilities of the Department are: (1) performance of all inspection and regulatory services relating to agriculture; (2) promotion of state agricultural products (sale and distribution of); and (3) enforcement of all state agricultural-related laws. Also included are the control of livestock health, license and control of pesticides, inspection of weighing devices, biological control of harmful insect and plant pests, and the prevention of cruelty to animals.

Presently there are 345 employees with the Commissioner appointed by the Governor. The Governor also appoints an agriculture commission composed of nine members to act in an advisory capacity.

The Department is currently divided into seven divisions: Administrative Services, Animal Industry, Livestock Inspection; State Fair, Inspection & Consumer Services, Markets Division and the Plant Industry Division.

C O L O R A D O - DEPARTMENT OF AGRICULTURE

Figure 2



Pollution Control and Abatement Programs

I. AIR

A. Introduction

The most outstandingly evident environmental pollution problem in the State of Colorado is air quality degradation. The state has been divided into eight Air Quality Control Regions (AQCR). Priorities have been assigned for the control of each major pollutant in each of the AQCR's. Pollutant priorities determine the amount and type of control and abatement program emphasis which is to be allocated to each region. Descriptions of the eight AQCR's follows, and the regions themselves are depicted on the following page.

AQCR I - Pawnee. The AQCR is predominantly agricultural but contains population centers, i.e., Fort Collins. High particulate standards are the result of fugitive dust during high winds. Violations of federal carbon monoxide standards occur as a result of poor air dispersion. The dispersion is caused by strong surface temperature inversion and eight surface winds accompanied by high vehicle flow.

AQCR II - Metro Denver. The major mobile source problems are the result of a large number of automobiles. Additionally, there are three major power plants, two oil refineries, and a number of other industrial sources that create pollution problems with carbon monoxide, particulates, nitrogen oxides, ozone, and hydrocarbons.

AQCR III - Comanche. Few air quality problems exist in this sparsely populated arid region.

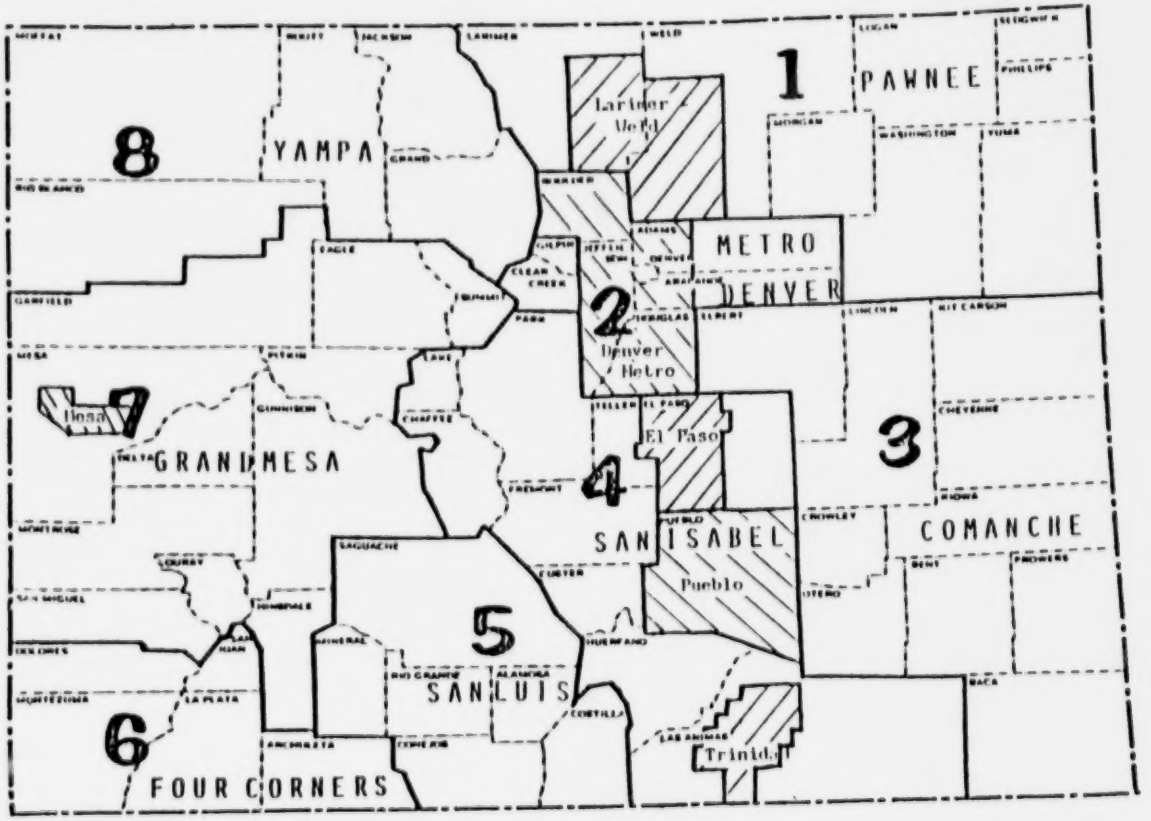


Figure 3 : Colorado Air Quality Control Regions (AQCR) and State Air Pollution Control Designated Areas.

AQCR IV - San Isabel. Colorado Springs and Pueblo are located here and contribute to this AQCR maintaining 25% of the state's population. Potential mobile source oriented pollution problems exist.

AQCR V - San Luis. Low population and lack of extensive industrialization contribute to making this region the most pollution free in Colorado.

AQCR VI - Four Corners. This is the smallest region, and major sources consist of tepee wood waste disposal burners. Orginally, it was felt that the Four Corners Power Plant located across the border in New Mexico would substantially affect the air quality of this region. However, monitoring studies show that almost no pollutants enter the AQCR from this source.

AQCR VII - Grand Mesa. This area is one that potentially may show the greatest air quality deterioration. This is due to coal and oil shale development.

AQCR VIII - Yampa. The majority of the stationary sources are in compliance here. The area has significant major particulate problems specifically due to vehicle induced fugitive dust. This is an energy impacted area, also, which will influence its future.

B. Workforce Profile

Information for the workforce profile as well as projected workforce was obtained by means of on-site and telephone interviews with Department of Health personnel and other experts in the field.

The State of Colorado has assigned the primary responsibility for air pollution control to the Air Pollution Control Commission. The Commission is responsible for developing and maintaining a comprehensive program for air pollution source prevention, abatement,and control. The Commission, then, is empowered with broad rule making authority. The Commission is organized into five subcommittees as follows:

- Stationary Sources;
- Automotive Emissions;
- Transportation Planning;
- Monitoring and Modeling; and
- Administrative Review.

The Pollution Variance Board is the rule suspension authority. The board is empowered to conduct hearings and conduct variance review.

The responsibility for program implementation has been delegated to the Colorado Health Department, Air Pollution Control Division. The division staff is distributed across the following sections:

- Air Quality Surveillance Section;
- Mobile Sources Control Section;
- Stationary Sources Control Section; and
- Program Planning & Budget Management.

The following table depicts the Air Pollution Control Division staffing levels.

STATE OF COLORADO

DEPARTMENT OF HEALTH

OFFICE OF HEALTH PROTECTION

ENVIRONMENTAL HEALTH

Air Pollution Control Division

Figure 4

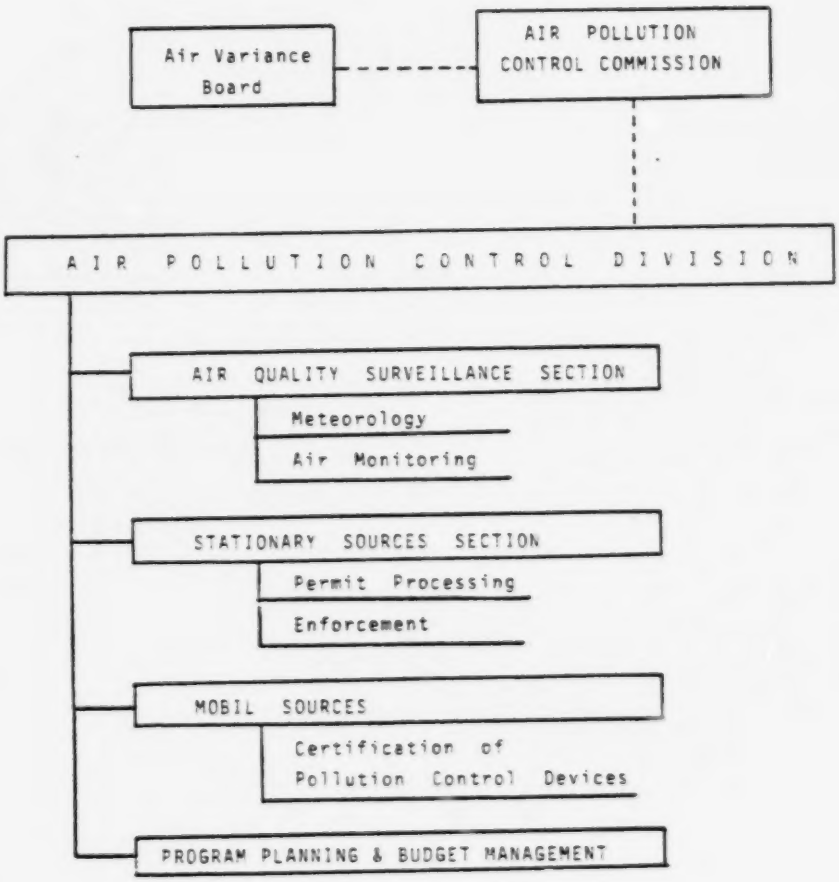


TABLE I

COLORADO HEALTH DEPARTMENT

Air Quality Control Division
Current (1976) Staffing Level

Position	1976	%/annum turnover (average)
Administrator	2	0%
Administrative Officer	3	0%
Planner	1	0%
Air Pollution Control Specialist	22	5%
Electronics Specialist[1]	8	5%
Automobile & Equipment Mechanic	2	6%
Chemist[2]	4	*
Lab Assistant[2]	1	*
Public Health Engineer	8	5%
Public Health Educator	1	5%
Secretarial	10	N/A
TOTAL	62	N/A

* unavailable;
[1] includes laboratory personnel;
[2] laboratory personnel.

The Air Quality Surveillance Section has the primary responsibility for operating the statewide air pollution monitoring and data handling system to meet requirements for monitoring and control strategies. This section also has responsibilities for modeling and meteorology.

The Mobile Sources Control Section conducts tests and evaluations of motor vehicle emissions. This section is responsible for developing programs to meet the pollution problems as they are directly impacted by high altitude. As in New Mexico, the altitude presents facets of the air pollution problem which are not elsewhere demonstrated.

The Stationary Sources Control Section has the responsibility to perform the enforcement and engineering functions necessary to implement the regulations and programs adopted by the Commission. Enforcement activities are a major component of the air pollution control and abatement program. As of June, 1976, there were 302 facilities in Colorado capable of emitting over 100 tons of a pollutant each year. Of this total, 294 were in compliance, seven were in violation and one was unknown.

The Program Planning and Budget Section is responsible for the budgeting of the Division. This section also has input into the revision process for the State Implementation Plan (SIP) for air quality.

Firm figures for personnel involved in air pollution control and abatement activities in Colorado are unavailable at this time. However, estimates have been made by Department of Health personnel that the air quality control workforce statewide approximates 75 persons.

C. Workforce Projections

Colorado's air quality program will experience increases in staff over the next three to five years. These increases in the workforce may be in the form of departmental inter-divisional transfers, however. At present, there is discussion in the legislature of not increasing state employees and, indeed, decreasing the total workforce eventually by five percent. This would affect the Air Pollution Control Division. Air quality is a priority item with the state and with the citizenry. Substantial cutbacks in this workforce are unlikely.

The following table details the projected workforce requirements to 1982 for the division. Air quality personnel across the state from the local and, especially, from the industrial sector should experience growth at a four to seven percent per annum rate.

TABLE II

COLORADO DEPARTMENT OF HEALTH

Air Quality Control Division
Workforce Projections to 1982 (est.)

Position	1976	1977	1978	1979	1980	1981	%/annum turnover (average)	%/annum growth (average)
Administrator	2	2	2	2	2	2	0%	0%
Administrative Officer	3	3	3	3	3	3	0%	0%
Planner	1	2	3	4	5	5	0%	42%
Air Pollution Control Specialist	22	22	23	23	24	25	5%	3%
Electronics Specialist[1]	8	8	8	8	8	8	5%	0%
Automobile & Equipment Mechanic	2	2	4	6	6	6	6%	30%
Instrument Technjcians	0	0	2	4	6	8	*	61%
Chemist[2]	4	4	4	4	4	5	*	5%
Laboratory Assistant	1	1	1	1	1	1	*	0%
Public Health Engineer	8	8	8	8	8	8	5%	0%
Public Health Educator	1	1	1	1	1	1	5%	0%
Secretarial	10	10	10	11	12	12	N/A	4%
TOTAL	62	63	69	75	80	84	N/A	7%

* unavailable

[1] includes laboratory personnel;

[2] laboratory personnel.

D. Training and Certification

Colorado State University conducts a major effort in air pollution control development of curriculum and training programs.

The state conducts a visible emissions school that is operated by the Surveillance Section. One school per month is sponsored depending upon the weather.

The U.S. Environmental Protection Agency (EPA) also conducts visible emission schools as well as an extensive number of other air pollution control and abatement programs. Upon occasion, Colorado cooperates with EPA in conducting these courses. In that event, the program is usually of two days duration.

A pilot program has been established by the Division which includes sampling of automobile emissions by region. In conjunction with the emissions testing program, data are gathered and assessed regarding the effects of motor vehicle emissions control measures upon gasoline mileage, performance, and other factors.

Currently, other training activities involve the development of an orientation and basic maintenance procedures training program in conjunction with the State Department of Revenue.

E. Career Potential

Available information indicates that the professional field will experience an average per annum growth of approximately five percent. The positions will be primarily at the degreed or higher levels in most situations, e.g., engineers, chemists, attorneys. Increased

regulatory and control activities could diversify career opportunities, and there may well develop a rather substantial need for individuals trained in short-term technical courses provided by state or federal agencies or in the vocational technical or community college programs. Similar courses might lead to careers as air pollution control aides and technicians, thereby providing the impetus for trainees to complete longer term study in specific academic programs. There is a significant need for air pollution education and research, even though present programs have been established in the state.

F. Conclusion

A major pollutant contributing to air quality decline especially in the Denver metropolitan area is carbon monoxide caused by automobile emissions. The Air Pollution Control Commission requested that the Air Quality Division develop an official standing regarding inspection and maintenance of mobile sources. The most recent recommendations include the following as reported in the Report to the Public - 1976:

- Inspection and maintenance of automobiles should be conducted annually. The facilities responsible would be certified, licensed, and controlled by the designated agency.
- Establishment of a curb idle exhaust emission test for hydrocarbons based on 40% rejection rate emission standards.
- All instruments and procedures should be certified by the Air Pollution Control Commission.
- Inspectors and repairmen involved in the program should be trained and should pass a certification examination.

The Department of Health operates two testing facilities in Colorado. This program is instrumental in gathering and assessing

information pertinent to emission characteristics of vehicles which are operated at high altitudes.

The Emission Test Center has been operational for one year and during that time, 4,100 tests were conducted. Information indicates that causes of high emissions are generally attributable to faulty ignition system components in automobiles. Other causes were carburetor malfunctions and malfunctioning emission control components. A major contributor to these studies is available due to the mobile emissions testing laboratory. Because this is a mobile unit, testing is being conducted where previously none existed.

Succinctly stated, the major recommendation for the control of motor vehicle caused air pollution in Colorado lies in the requirement that all 1977 and newer automobiles must undergo annual emissions inspections. This issue is currently before the legislature.

The success or failure of an air pollution control and abatement program in Colorado will hinge substantially upon the education of the public. To this end, the Division has designated a Public Health Educator to prepare brochures, distribute educational materials, and work with community action groups. This person also assists at the Smoke School (visible emissions evaluation training). Also, the Department of Health conducts a full scale public information campaign in an effort to involve as much of the public as possible.

II. NOISE

A. Introduction

Colorado state law assigns responsibility for noise pollution control and abatement to the counties and, specifically, to the municipalities. Standards for environmental noise have been established by the state legislature. Currently, there are 12 municipalities across the state which have established regulations regarding noise. These regulations are of two types: with or without acoustical criteria. Those with acoustical criteria are referred to as performance regulations. Those without acoustical criteria are non-quantitative. Because the latter are without noise limits, they are difficult to enforce.

The following table details these regulations.

B. Workforce Profile

The Colorado Department of Health has been identified as the lead state agency for noise pollution control and abatement. The state level program is not extensive and has a small workforce assigned at present. The Department of Health has allocated this responsibility to the Occupational and Radiological Health Division. Table four illustrates the current workforce assigned to environmental noise control. The personnel, however, do not allocate full-time to this area of responsibility.

TABLE III

STATE OF COLORADO

Municipal Noise Ordinances
(1976)

COMMUNITY	ORDINANCE								TOTAL		
	Aircraft	Building	Construction	Nuisance	Railroad	Vehicle	Rec./Vehicle	Zoning	a	b	
Arvada				b		a		a	2	1	3
Aspen				b		a		a	2	1	3
Aurora								a	1	0	1
Boulder				b		a	a		2	1	3
Colorado Springs	a			b	a	a		a	4	1	5
Denver				b		a		a	2	1	3
Dillon						b			0	1	1
Englewood				b		a		a	2	1	3
Fort Collins			a	b		a	a	a	4	1	5
Lakewood			a	a		a	a	a	5	0	5
Littleton			a	b		a	a	a	4	1	5
Wheat Ridge				b					0	1	1
TOTAL (a)	1	0	3	1	1	9	4	9	28	0	
(b)	0	0	0	9	0	1	0	0	0	10	
	1	0	3	10	1	10	4	9	28	10	38

KEY: a = Regulation includes acoustical criteria;
b = Regulation does not include acoustical criteria.

SOURCE: Sound & Vibration, December, 1976. Clifford R. Bragdon, Contributing Editor.

TABLE IV

COLORADO DEPARTMENT OF HEALTH

Office of Environmental Health
Occupational & Radiological Health Division
Occupational Health Section
Current (1976) Staffing Level

Position	1976	%/annum turnover (average)
Division Director	1	0%
Health Physicist	1	0%
Secretarial	1	N/A
TOTAL	3	N/A

Currently the major undertaking of this staff is a project initiated and funded by the U.S. Environmental Protection Agency (EPA) Region VIII. This project is funded to establish comprehensive noise control programs utilizing land-use planning. The project target communities are energy impacted. The municipalities will be chosen relative to the severity of environmental noise generated by coal and oil shale development as it causes rapid expansion of the community. These energy impacted communities are, for the most part, located in western Colorado. A willingness on the part of the community to establish a noise control program and to then assist other communities, is a necessary prerequisite to this program.

Department of Health personnel were most helpful in providing information regarding workforce profiles and projections. This information retrieval was accomplished by on-site interviews and telephone surveys.

The number of people involved in noise pollution control and abatement activities across the state has been estimated to total 12 to 15. These personnel figures are not inclusive of law enforcement officials,who are involved to a part-time degree. Additionally, there are engineering and architectural firms as well as university personnel who contribute to this workforce profile. Sources in the field, however, cannot provide estimates of the number of persons engaged in these consulting activities on noise control projects.

C. Workforce Projections

Professionals in the field have estimated minimal increases in workforce for Colorado in the area of noise control. At the state level as well as the local level increases are not anticipated to exceed 5% per annum. The state level staff increases will more than likely approximate a figure less than 4% per annum for the next three to five years.

D. Training and Certification

The engineering departments of the universities and colleges in the state provide some courses in the noise field. It appears that there are no vocational-technical level certification programs at present.

Under the terms of the Colorado Health Department project, Occupational Health personnel will be training municipal officials and personnel. This training will be conducted cooperatively with the regional office of the EPA. Technical assistance is a major component of this program also.

E. Career Potential

Currently, there is little evidence that a significant number of career opportunities will develop over the next three to five years. Specifically, this may be credited to the fact that environmental noise pollution control has not as yet developed as a distinct professional area. Currently, there is very little interest in the field. Environmental engineers and health physicists in both the public and private sector will be required for the limited number of openings which are anticipated.

F. Conclusion

The Colorado program to establish noise control programs in energy impacted communities of western Colorado will include active participation by a limited staff. Presentations to community officials, proposals regarding land use and zoning, designation of routes for heavy trucks will all be on-going activities as this program is developed.

The major aspect of this program or any future noise control program, especially in the west, is the education of the public. Should this component of the program be mismanaged or poorly facilitated, major setbacks most probably would occur to the establishment of other noise abatement programs.

The establishment of training program, expecially on the less than degreed level, may be necessary if noise control programs develop in increasing numbers at the municipal level.

III. PESTICIDES

A. Introduction

Colorado is an agricultural state, averaging approximately 29,500 farms of 1,353 acres each. As in other western states, the land under farming as well as the total number of farms is declining while the average number of acres per unit is increasing.

There has been a State Pesticide Act since 1965. This Act was supported by the pesticide manufacturing industry for the general protection of the people of the State of Colorado. The state registers every pesticide that is advertised, distributed, or sold within Colorado, as well as those transported intrastate. These registrations are renewed annually. Colorado conducts inspections statewide for non-registered, mislabeled, or repackaged products, and for pesticides which are sold from bulk containers.

The major responsibility for pesticides programs and related activities in the State of Colorado has been allocated to the Department of Agriculture, Plant Industry Division.

Information regarding current and projected workforce profiles is the result of on-site interviews and telephone surveys with Plant Industry Division personnel.

B. Workforce Profile

The current workforce assigned to the Division of Plant Industry is dispersed across four sections:

- Seeds, Pest Districts & Apiary Section;
- Nursery, Greenhouse and Quarantine Section;
- Biological Control Section; and
- Pesticides, Pesticide Applicators, Structural Pest Control Section.

The following table details the current workforce of the Plant Industry Division. In conjunction with this staff, there is a laboratory which conducts pesticides analyses. The laboratory personnel are included below.

TABLE V

COLORADO DEPARTMENT OF AGRICULTURE

Plant Industry Division
Pesticides Personnel
Current (1976) Staffing Level

Position	1976	%/annum turnover (average)
Division Director	1	0%
Pesticides Specialist**	1	0%
Pesticides Inspector	3	5%
Chemist[1]	2	*
Lab Technician[1]	1	*
Secretarial[2]	2	N/A
TOTAL	10	N/A

* unavailable;
** Section Chief;
[1] Laboratory personnel;
[2] includes laboratory personnel.

The Seeds, Pest Districts & Apiary Section is responsible for seed inspection, registration and inspection of bee colonies, and conducts noxious weed programs.

The Nursery, Greenhouse and Quarantine Section license and inspect nurseries, maintain a quarantine section, and check outgoing plants and plant products.

The Biological Control Section conducts insectary operations at Palisade, Colorado.

The major responsibilities for registration, licensing, and inspection of pesticides and pesticides dealers has been allocated to the Pesticides, Pesticide Applicators, Structural Pest Control Section. The methods of pesticide application are also a closely integrated component of this section's activities. The control of pests in buildings, referred to as Structural Pest Control, is also a responsibility of this section.

Depicted below are the applicator personnel across the state including the number of private applicators (farmers) who are potentially estimated to require certification of restricted-use pesticides.

TABLE VI

STATE OF COLORADO

Pesticides Personnel
Current (1976) Staffing Level
(estimated)

Category		1976	%/annum turnover (average)
Commercial Applicator		2763	10%
Agricultural Pest Control	162		
Plant			
Animal			
Forest Pest Control	104		
Ornamental & Turf Pest Control	1562		
Seed Treatment	97		

TABLE VI

(continued)

Category	1976	%/annum turnover (average)
Aquatic Pest	13	
Right-of-way	410	
Industrial, Institutional, Structural and Health Related	214	
Public Health Pest Control	44	
Regulatory Pest Control	37	
Demonstration & Research	120	
Private Applicators	17,500	N/A
TOTAL	20,263	N/A

If every farmer in the state were to require certification, the table above would reflect 29,500 private applicators. However, the private applicator does not have to be certified in order to utilize non-restricted pesticides on his own land. A comparison of applications and quantities for the fiscal year 1975 points to extensive use of 2,4 D in Colorado. The predominant use of 2,4D,as well as the farmer opting to hire commercial applicators to apply restricted-use chemicals, might alter the estimated number of certified private applicators.

C. Workforce Projections

The table below illustrates the estimated workforce required for Department of Agriculture pesticide personnel to 1982. It is stressed that these figures represent the best professional estimates of personnel working in the pesticides control area.

TABLE VII

COLORADO DEPARTMENT OF AGRICULTURE

Plant Industry Division
Pesticides Personnel
Workforce Projections to 1982 (est.)

Position	1976	1977	1978	1979	1980	1981	%/annum turnover (average)	%/annum growth (average)
Division Director	1	1	1	1	1	1	0%	0%
Pesticide Specialist	1**	1	2	2	2	2	0%	20%
Pesticide Inspector	3	3	4	5	5	5	5%	12%
Chemist[1]	2	2	2	2	2	2	*	0%
Lab Technician[1]	1	1	1	1	1	1	*	0%
Secretarial[2]	2	2	2	3	3	3	N/A	10%
TOTAL	10	10	12	14	14	14	N/A	7%

* unavailable
** Section Chief
[1] Laboratory personnel
[2] includes laboratory personnel

The above table reflects a workforce stabilization for laboratory personnel. The following table details the best professional estimates on the part of Department personnel, regarding workforce requirements to 1982 statewide, specifically for applicators.

TABLE VIII

STATE OF COLORADO

Pesticide Personnel
Workforce Projections to 1982 (est.)

Position	1976	1977	1978	1979	1980	1981	%/annum turnover (average)	%/annum growth (average)
Commercial Applicator	2763	2846	2931	3019	3049	3079	10%	2%
Private Applicator	17,500	17,500	17,500	17,500	17,150	17,150	N/A	-.4%
TOTAL	20,263	20,346	20,431	20,519	20,199	20,229		N/A

The above table depicts a three percent per annum increase in commercial applicators to 1979 and a one percent per annum increase thereafter. Private applicators will experience zero growth to 1979, a 2% decrease in 1980 and no change for 1981.

D. Training and Certification

The Colorado State University Cooperative Extension Service is the only state agency that is cooperatively involved in the training and certification of applicators program. The extension service will conduct all training. Training of both commercial and private applicators is in the early stages in Colorado. To date, approximately 205 commercial applicators have been trained; 1,700 remain to be trained. Of the private applicator category, none have been trained.

Curriculum materials have received some criticism. Currently, these materials are being revised, and Department of Agriculture personnel will take an active part in this revision.

E. Career Potential

There has been a slight decrease in the number of firms licensed to do structural work in Colorado. Other areas of decline include aerial operators, licensed ground applicators, and pieces of equipment used. Within the state, the number of companies registering products also is declining. Employment opportunities should be available, however, over the next three years. These career options may be limited.

F. Conclusion

The Department of Agriculture presently conducts an extensive pesticides-related program, utilizing a rather limited staff. One area of increasing activity is the number of products registered with the state. There has been steady growth followed by a leveling in this area over the last three years: 1973 = 4,880; 1974 = 5,403; 1975 = 6,063; and 1976 = 6,055.

The number of requests for technical assistance pursuant to detecting and evaluating chemical damage has reached levels difficult to manage. However, slight increases in staff and possible reallocation of work responsibilities will alleviate this problem.

The State of Colorado currently has an on-going Integrated Pest Management Program (IPM). The previously mentioned Biological Control Section conducts insectary operation in order to produce beneficial parasites to combat weed and insect pests, which are damaging crops. This IPM program began as a single purpose program in order to produce the Oriental Fruit Moth. Today, parasites are produced to assist

in Thistle, Alfalfa Weevil and Dutch Elm Disease. This program element of the Plant Industry Division is innovative and unique to the federal Region VIII states. Currently, this program is understaffed also. Increases across the Division for the further efficient administration of these pesticide programs is recommended.

IV. POTABLE WATER

A. Introduction

Water is a premium commodity in the western states. Colorado presents no exception to this fact. The state is also experiencing rapid growth in some metropolitan areas due to in-migration. Energy development has affected several of the states communities. Expansion of cities and industrial growth have placed an increasing strain on water supplies. Adequate quantities of water will remain a western problem for some time.

The majority of Colorado's citizens have water which is supplied by means of community systems. The following table illustrates the number of water supplies within the State of Colorado that have been currently identified by the Colorado Department of Health. These include wells, creeks, springs, reservoirs, rivers, and lakes. Ownership categories are described as private, municipal, county, state, and the City of Denver.

TABLE IX

COLORADO WATER TREATMENT PLANTS

Classification Listing - 1975

Plant Classification	1976
A (highest)	20
B	28
C	106
D (lowest)	292
N*	94
TOTAL	540

* unclassified or not required to have an operator.

Colorado personnel estimate that the above listing of classified water plants is relatively up-to-date, although new plants have been built within the last twelve months.

Colorado state law has established minimum standards for water that is to be used for drinking or for cooking. These standards include physical, chemical, bacteriological and radiological parameters. Chlorination is the minimum treatment established for water supplies.

B. Workforce Profile

Information regarding the current, as well as the projected, workforce profiles was obtained by on-site interviews and telephone conservations with environmental health personnel across the state.

The state law has designated the Colorado Department of Health, Water Quality Control and Public Health Engineering Division as the lead agency for potable water responsibilities and activities.

Colorado state law allocates to the Department of Health the primary responsibility for establishing and enforcing minimum quality standards for drinking water. Under the same law, the Department is responsible for advising owners of public water supplies on methods or processes that will aid in the purification or in the protection of public water. The major activities of the Division, relative to potable water, also include the following:

- technical assistance to communities;
- reviewing of plans for facilities construction;
- training and certification of water treatment and distribution of plant personnel.

The following details the potable water section of the Water Quality and Public Health Engineering Division.

TABLE X

COLORADO DEPARTMENT OF HEALTH

Water Quality Control and Public Health Engineering Division
Potable Water Personnel
Current (1976) Staffing Level

Position	1976	%/annum turnover (average)
Administrator	1	0%
Engineer	16	2%
Secretarial	4	N/A
TOTAL	21	N/A

The exact figures for certified operators in Colorado is difficult to determine. The following, therefore, illustrates efforts to assign numerical values to each classification category. These figures were determined by thorough examination of records of certified operators. The following table illustrates the number of certified operators within the State of Colorado.

TABLE XI

COLORADO WATER TREATMENT PLANT PERSONNEL

Certified Operators
Current (1976) Staffing Level

Classification	1976	%/annum turnover (average)
A (highest)	186	40%
B	132	45%
C	325	50%
D (lowest)	418	50%
TOTAL	1,061	46%

Approximately 400 persons hold certificates in both water and wastewater in the State of Colorado. The table below depicts the number of persons in Colorado certified in both areas. The figures are current (January 1977) according to the Water Division of the Colorado Department of Health.

TABLE XII

COLORADO CERTIFIED OPERATORS

(Certified Water & Wastewater)
Current (1976) Staffing Level

Classification	1976	%/annum turnover (average)
A (highest)	103	40%
B	43	45%
C	130	50%
D (lowest)	124	50%
TOTAL	400	46%

The turnover rate has been estimated by state training officials to be as high as 65% in some areas of the state.

C. Workforce Projections

Increases are anticipated to occur within the ranks of drinking water personnel. The state level workforce requirements are illustrated in the table following. The projections depicted in the following tables are the result of composites of judgements of professionals from the drinking water field.

TABLE XIII

COLORADO DEPARTMENT OF HEALTH

Water Quality Control & Public Health Engineering Division
Potable Water Personnel
Workforce Projections to 1982 (est.)

Position	1976	1977	1978	1979	1980	1981	%/annum turnover (average)	%/annum growth (average)
Administrator	1	1	1	1	1	1	0%	0%
Engineer	16	18	19	20	20	21	5%	6%
Secretarial	4	4	5	5	5	5	N/A	5%
TOTAL	21	23	25	26	26	27	N/A	5%

The following details the anticipated growth for the water supply and treatment plant certified personnel.

TABLE XIV

COLORADO WATER SUPPLY & TREATMENT PERSONNEL

Workforce Projections to 1982 (est.)

Class	1976	1977	1978	1979	1980	1981	%/annum turnover (average)	%/annum growth (average)
A	186	205	225	236	241	245	40%	6%
B	132	145	159	174	187	191	45%	8%
C	325	389	482	578	636	699	50%	17%
D	418	500	550	605	665	731	50%	12%
TOTAL	1061	1239	1416	1593	1729	1866		12%

The above projections are predicted on: increases in the salary scales of workers outside the Denver metropolitan area; a need for upgraded personnel on the operative level and the development of energy resources mostly on the western slope.

D. Training and Certification

Colorado has been certifying operators for twenty years, but has had mandatory certification only since 1973. The certification is pursuant to the authority of Article 9 of Title 25, C.R.S. 1973.

The operator of a plant must be certified in a class equal to or higher than the class of the plant. A supervising operator may not be in charge of more than one plant without a special authorization. There are also experience requirements for the various classifications, in addition to the successful completion of the certification exam. Certification is valid for a period of five years. The certificate of an operator in good standing will be renewed every five years upon written application without examination. The certification examinations are given twice each year, in September and in March.

E. Career Potential

Career opportunities will be available to non-degreed personnel at the operator level. The Department of Health personnel estimate that there will be substantial increases in the number of water supplies which will create needs for operators. There will be occupational openings on the degreed level, i.e., Engineer, Biologist and Chemist. The following opportunities should be available over the next three to five years: Chemical Engineer, Industrial Hygienist, Sanitary Engineer and laboratory personnel.

F. Conclusion

The growth and expansion of Colorado cities and the proliferation of industry has and will continue to place even greater responsibility on the state to maintain the purity of drinking water.

The life blood of Colorado is water. Beginning with the small irrigation ditches of the 1850s in the San Luis Valley, Colorado has developed dams and reservoirs with capacities for storing water for irrigation, power, industrial, and municipal uses. There are tunnels that have been bored through the mountains to carry water from the west to the east, as the Eastern Slope is the more populated area of Colorado. Towns have been moved, canals dug, and ranches submerged in an effort to meet the ever increasing demands for water.

V. RADIATION

A. Introduction

Within the borders of the State of Colorado are numerous sources of natural and man-made radiation. Two examples, which are of interest to the citizens of the state, are the Rocky Flats Plant and the Fort St. Vrain Nuclear Generating Station.

Rocky Flats, located near Boulder and Golden, is a metal production and chemical processing facility which handles nuclear material such as plutonium and uranium. Production related research, development, engineering design, fabrication, and assembly of components are all on-going activities at this plant site which is operated by the Atomic International Division of Rockwell International.

The hazards associated with Rocky Flats are two fold: radiation emissions from radioactive materials, and chemicals utilized in the various plant processes. The major fascination, on the part of the public, is the general health hazard potential associated with environmental releases of plutonium.

The Fort St. Vrain Nuclear Generating Station, operated by the Public Service Company, is located 35 miles north of Denver in a predominately agricultural area. With the exception of the reactor, the generating station is a conventional electric power plant. The Station received its first reactor core loading in January 1974. Since then, low level testing has been conducted. In December 1976, it was announced that the Fort St. Vrain generating station was activated and generating

85,000 kilowatts of power. The plant capacity is 330,000 kilowatts, but it will continue operating at low levels for the time being.

Both of these areas are under surveillance by the State of Colorado, and sampling of air, water, feed and grain, milk and soil and sediment is on-going. Reports of the sampling activities are prepared annually by the state.

B. Workforce Profile

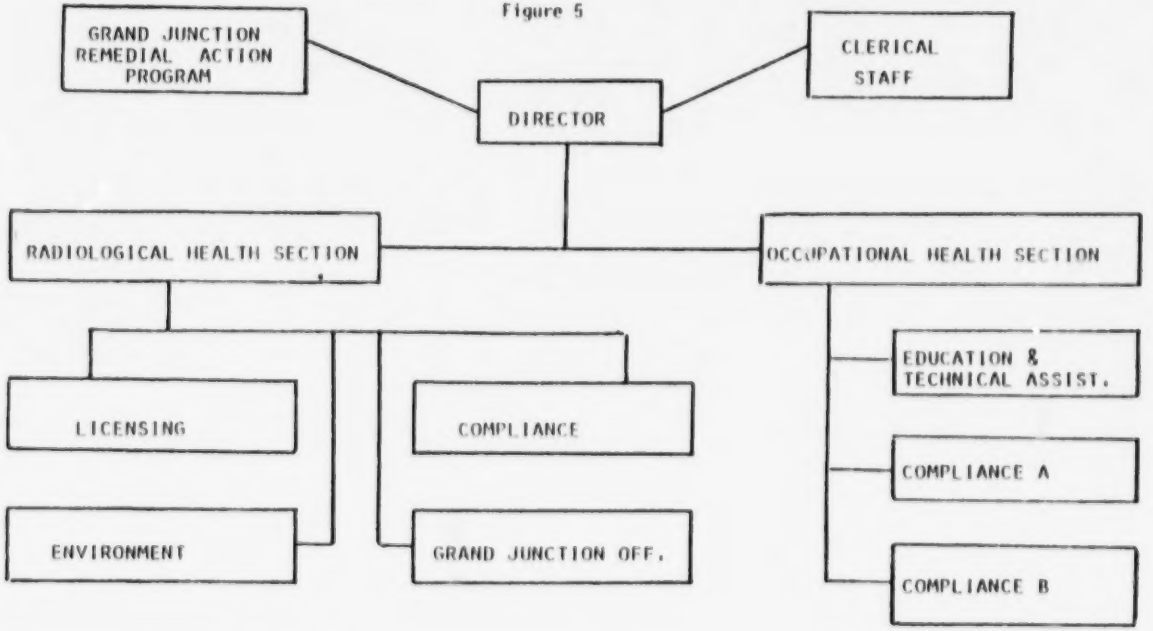
The Legislature has charged the Colorado Department of Health, Occupational and Radiological Health Division with the responsibility of assuring that occupational exposures, environmental contamination, and public exposure to radiation are kept to as low a level as practicable. The Department has an extensive registration and inspection program for X-ray machines used in medicine, industry, and research. Continuous monitoring is on-going in order to determine radioactive contamination to the environment. An organizational chart for the Division is included in the following pages.

Acting in an advisory capacity to the Department and the Division is the Radiation Advisory Committee, which is composed of nine members from the areas of education, industry, and the medical and allied fields.

The following tables detail the current workforce for the state personnel involved in radiation control in Colorado.

COLORADO DEPARTMENT OF HEALTH - OCCUPATIONAL & RADIOLOGICAL HEALTH DIVISION

Figure 5



NOTE: COMPLIANCE A & B = COSH

TABLE XV

COLORADO DEPARTMENT OF HEALTH

Occupational & Radiological Health Division
Current (1976) Staffing Level

Position	(a)	(b)	1976	%/annum tunover (average)
Administrator	1	1	2	0%
Chemist	2	0	2	3%
Health Physicist	0	14	14	3%
Instrument Technician	1	2	3	5%
Industrial Hygienist	9	0	9	5%
Field Contracts Representative	0	1	1	*
Secretarial	3	4	7	N/A
TOTAL	16	22	38	N/A

(a) Occupational Health;
(b) Radiological Health.
* unavailable

The Division is composed of two sections: Occupational Health and Radiological Health. The Occupational Health Section has responsibilities in the areas of compliance, education, and technical assistance. The Radiological Health Section has detailed responsibilities in regulatory and environmental control. Grand Junction, Colorado (a community with uranium activities) is a separate program of the section.

The following details the current estimated workforce across the state. These estimates are the result of on-site interviews with personnel from the Colorado Department of Health, as is the previous workforce profile. Revision of the statewide figures which follow is most probable as radiation personnel and activities assessments are conducted across the state. Contributing to the table below is the

U.S. Energy Research and Development Administration publication #78, An Analysis of Nuclear Related Technician Manpower in Western States, November, 1975.

TABLE XVI

COLORADO RADIATION PERSONNEL

Current (1976) Staffing Level
(estimated)

Position	1976	%/annum turnover (average)
Nuclear Power Plant Operator	15	*
Nuclear Material Processor	14	*
Nuclear Facility Equipment Operator	33	*
Nuclear Facility Maintenance Technician	211	*
Plutonium Handling Technician	501	*
Radiation Control Technician	135	*
Radiochemistry Technician	48	*
Radiographer	61	*
Nuclear Geological Technician	16	*
Well-Logging Technician	40	*
X-Ray Calibration Technician	1	*
Radiologic Technologist**	465	*
Nuclear Medical Technologist	87	*
Radiation Therapy Technician	31	*
Radiobiology Technician	15	*
Soil Evaluation	102	*
Radiation Biologist	5	*
Radiation Safety Officer	300	*
Environmental Monitor	100	*
X-Ray Technicians***	3,000	
TOTAL	5,180	

* unavailable
** Colorado Department of Labor & Employment figures = 700
*** Includes medical/dental/veterinary personnel not necessarily registered.

C. Workforce Projections

The following table illustrates the estimated projected workforce requirements to 1982 for the Occupational and Radiological Health personnel.

TABLE XVII

COLORADO DEPARTMENT OF HEALTH

Occupational & Radiological Health Division
Workforce Projections to 1982 (est.)

Position	1976	1977	1978	1979	1980	1981	%/annum turnover (average)	%/annum growth (average)
Administrator	2	2	2	2	2	2	0%	0%
Chemist	2	2	3	3	3	3	3%	10%
Health Physicist	14	14	15	16	16	16	3%	3%
Instrument Technician	3	3	3	3	3	3	5%	0%
Industrial Hygienist	9	9	9	9	9	9	5%	0%
Field Contracts Representative	1	1	1	1	1	1	*	0%
Secretarial	7	7	7	7	7	7	N/A	0%
Keypunch	0	0	1	1	1	1	*	N/A
TOTAL	38	38	41	42	42	42	N/A	2%

* unavailable.

The private sector and other non-state personnel are anticipated to experience a per annum increase of 4% to 6% to 1982.

D. Training and Certification

State personnel conduct training programs for various sectors of the population. X-ray personnel receive training on a one-to-one basis during inspection visits. Emergency response is an important component of the state program. The Occupational & Radiological Health Division conducts training and offers technical assistance and expertise to those emergency response agencies across the state. These

agencies are composed of persons who, in the event of a radiation related emergency, would be responsible for activating a response plan.

Training is offered at various institutions across the state. The following table details training available in Colorado and is not considered to be a complete listing.

TABLE XVIII

STATE OF COLORADO

Radiation Training

Facility/Institution	Course
St. Luke's Hospital, Denver	Radiologic Technology Radiation Therapy Nuclear Medical Technology
Beth Israel Hospital, Denver	Radiologic Technology
St. Anthony's Hospital, Denver	Radiologic Technology Nuclear Medical Technology
University Colorado Medical Center, Denver	Radiologic Technology Radiation Therapy Nuclear Medical Technology
Boulder Community Hospital, Boulder	Radiologic Technology
Department of Radiology, U.S.A.F. Academy Hospital Colorado Springs	Radiologic Technology
University of Colorado, Health Physics Lab, Boulder	Health Physics Technician

E. Career Potential

Career potential appears to be good in the area of radiation control in Colorado to 1982. Nuclear emphasis will be a specialized area of expertise in the engineering and scientific fields, as well as in the technician category. Health Physicists should see job opportunities, as this is an ever-increasing field.

Increased mining and milling activities, as well as a possible increase in nuclear power plants, will offer job opportunities with a wide range of skill levels represented. Overall, job opportunities are expected to develop for highly trained engineers and health physicists as well as technician, maintenance, and labor personnel. The Colorado radiation activities may encourage the emergence of new and distinct career options over the next few years.

F. Conclusion

Radiation uses should continue to proliferate in Colorado in the future. Mining, milling, and the nuclear generating endeavors within the state will present new and varied challenges to personnel involved with radiation control. Presently, the Environmental Radiation Ambient Monitoring System (ERAMS) is maintained by the U.S. EPA within Colorado and other western states. The U.S. Energy Research and Development Administration (ERDA) activated its Nevada Test Site Air Surveillance Network. This network includes four stations in Colorado, normally activated during underground nuclear tests in Nevada.

Colorado is an "agreement" state. This term refers to an agreement between the U.S. Nuclear Regulatory Commission (NRC) and the

state in which certain of the Commission's responsibilities are accepted by the state. This agreement grants Colorado the authority to license and inspect all nuclear materials users within the state except at federal installations. Colorado maintains approximately 331 licenses of by-product, source, or special nuclear materials. Of this 331 total, 49 are NRC licenses.and 282 are state licenses. Colorado has reported no incidents involving radium or radon during the last two years. A total of 77 (approximately) radium/radon facilities are located in Colorado.

Recently,a Colorado bill for "ionizing radiation" provided authority to inspect in federal installations. Although prior to this the NRC agreement preempted this activity, Colorado officials were granted security clearance for these installations.

The radiation control workforce will increase over the coming years. The career options,as well as emerging specialized occupations, will impact the workforce picture in Colorado.

VI. SOLID WASTE

A. Introduction

The primary responsibility for solid waste management in Colorado has been allocated to the Department of Health, Engineering Division, which has recently been consolidated with the Water Division. It is the responsibility of this Solid Waste Management Section, under the Solid Waste Act, to regulate and control solid waste sites and facilities. The Act has been codified for county commissioners. Presently, there are 63 counties and 13 management and planning areas across the state. The Solid Waste Management Section maintains inventories of all disposal sites, inspects sites and facilities, evaluates methods of disposal, and advises county commissioners concerning the designation of sites. The Department reviews plans for all new sites and facilities. Currently, there are 250 sites located across the state, and 60% of these are defined by the Department as in compliance.

B. Workforce Profile

The state staff is assigned to the Division of Engineering and is not, as yet, a separate divisional program. With the advent of new solid waste legislation, however, this program will more than likely be accorded more emphasis.

Information regarding the current, as well as the projected workforce profiles, was obtained by on-site interviews with state solid waste management program personnel. The following table illustrates the current workforce at the state level.

TABLE XIX

COLORADO DEPARTMENT OF HEALTH

Engineering Division
Solid Waste Management Section
Current (1976) Staffing Level

Position	1976	%/annum turnover (average)
Section Chief	1	0%
Engineer	4	3%
Secretarial	2	N/A
TOTAL	7	N/A

Estimations of the current workforce statewide are depicted in the following table.

TABLE XX

COLORADO SOLID WASTE MANAGEMENT PERSONNEL

Current (1976) Staffing Level
(estimated)

Position	1976	%/annum turnover (average)
Engineer & Sanitarian	40	5%
Operators	200	25%
TOTAL	240	

No firm figures are available other than those depicted above. However, crew size ranges from one to twelve persons.

C. Workforce Projections

The following figures are estimations of the projected workforce requirements for the area of solid waste. They represent the best

professional judgements of those in the field. Increases are depicted for the state level personnel.

TABLE XXI

COLORADO DEPARTMENT OF HEALTH

Engineering Division
Solid Waste Management
Workforce Projections to 1982 (est.)

Position	1976	1977	1978	1979	1980	1981	%/annum turnover (average)	%/annum growth (average)
Section Chief	1	1	1	1	1	1	0%	0%
Engineer	4	4	6	6	7	8	3%	16%
Geologist	0	0	1	1	1	1	*	N/A
Secretarial	2	2	3	3	3	3	N/A	10%
TOTAL	7	7	11	11	12	13	N/A	15%

* unavailable

Sources in the field point out that with new solid waste management legislation, these figures could increase by five times those depicted.

The table above also includes additional engineering personnel with agricultural expertise who will be used to meet the ever increasing problems of sludge.

Solid waste management will experience growth rates per annum as depicted on the following table. The table details the estimated projected workforce requirements for the statewide solid waste management personnel.

TABLE XXII

COLORADO SOLID WASTE MANAGEMENT PERSONNEL

Workforce Projections to 1982 (est.)

Position	1976	1977	1978	1979	1980	1981	%/annum turnover (average)	%/annum growth (average)
Engineer/ Sanitarian	40	40	66	80	98	103	5%	23%
Operator	200	225	230	260	275	300	25%	9%
Planner	0	4	8	10	11	13	*	30%
TOTAL	240	279	304	350	384	416	N/A	12%

* unavailable

D. Training and Certification

Currently conducted for the thirteen management and planning regions are training seminars to evaluate site problems, review developing technology, review the state Act and Departmental regulations, and to provide guidance and assistance with problems of compliance. These seminars are for operators and management personnel as well. There are also training courses for operators to demonstrate the satisfactory operating techniques. Safety procedures are also presented to alleviate personnel accidents. An average of five training sessions of one day's duration each per year are presented.

This training effort is conducted by departmental engineers in conjunction with the district engineers.

Although there is no certification at present, eventually operators will probably be certified. But, at present, private industry expresses only antagonism to a certification program.

E. Career Potential

Career opportunities will be available within the state over the next five years. The number of operators will increase, and the need for degreed level personnel also will increase. Specifically, engineers with expertise in chemical, mechanical, and agricultural fields will be representative of career potentials to 1982.

F. Conclusion

The most feasible location for resource recovery in Colorado was thought to be Denver. However, a study of the Council of Governments (COG) assessed the possibility of uitlizing resource recovery as a means of supplying supplemental fuel. This study revealed that the cost would be prohibitive. Thus, Denver has been deleted from the list of possibilities. The new Resource Recovery and Conservation Act will more than likely present the state with additional challenges for the future.

A major thrust of the Colorado solid waste management program consists of an on-going effort directed towards the preparation of an inventory of hazardous waste sources. The other major endeavor of the program involves the closing or conversion of sites which currently are not in compliance. Presently, there are 250 sites within the state, and 60% of these are in compliance.

Toxic and hazardous materials are not received at these sites. Hazardous materials have not presented a problem, as yet, in Colorado. Toxic substances are presently stored on home-sites or disposed of outside of the state.

The Rocky Flats Plant of Rockwell International, mentioned in Section V, Radiation, has a $150 million facility entitled Rocky Flats Plant Plutonium Recovery Facility. Recently, the major contractor was removed from the project.

The new facility, when completed, will consist of one large structure with three ports:

- the Plutonium Recovery Facility (371);
- the Supportive Facility; and
- the Waste Treatment Facility.

The plutonium recovery process will be similar to those now being used at the site, but will be expanded to recover much lower levels of plutonium waste. This plant will recover low level residues that are now shipped out of state, thereby greatly reducing radioactive waste sent off-site for long term storage. Examples such as this lend an increasing note of challenge and excitement to the Colorado program, as it enters the hazardous and toxic waste problem areas.

VII. WASTEWATER

A. Introduction

In 1973,the Legislature provided the legal basis for the state's water quality control program with the passage of the Colorado Water Quality Control Act. This Act is administered through the Colorado Department of Health, Water Quality Control and Public Health Engineering Division. There is a Water Quality Control Commission that is charged by the Act to establish standards for all state waters, adopt appropriate regulations, and develop a statewide control program.

In order to meet these goals, the Division has established a program of positive control of wastewater discharges. To that end, the program is aimed at providing better wastewater treatment and removing greater amounts of pollutants from the wastewater prior to its entry into streams.

The Division,therefore, enacts the programs of the Commission and enforces the provisions of the law. The chief aim of this program is to raise the quality of all degraded state waters and to protect the high quality waters from degradation.

The table below illustrates the currently identified and classified wastewater treatment plants across the State of Colorado.

TABLE XXIII

COLORADO WASTEWATER TREATMENT PLANTS

Classification Listing - 1976

Plant Classification	1976
A (highest)	29
B	52
C	221
D (lowest)	211
TOTAL	513

Colorado Health personnel have estimated that the total number of wastewater facilities across the state is approximately 800 (as of January 1977). However, as of this writing, these additional 287 (approximate number) have not been identified, classified, and filed according to the Water Division format.

B. Workforce Profile

The wastewater effort is carried out by five sections of the Water Quality Control and Public Health Engineering Division:

- Planning Section;
- Technical Services Section;
- Monitoring and Enforcement Section;
- Monitoring and Field Studies Section; and
- Water Quality Management Section.

The Planning Section is responsible for the development of plans, hydrologic analysis, and quantity data banks.

The Technical Services Section is responsible for wastewater

treatment grants, operations and maintenance services, industrial and domestic waste consultation, and training and certification of wastewater treatment plant personnel.

The Monitoring and Enforcement Section and the Monitoring and Field Studies Section are responsible for the following program elements: effluent and stream monitoring, non-point source control, and wastewater discharge permitting.

The Water Quality Management Planning Section primarily emphasizes control activities on the state's most serious problems. These include river basin plans, input into the area-wide planning program, and examination of all possible sources and effects of water pollution. This Section also is responsible for recommending alternative courses of action regarding water pollution control and abatement, as well as prevention.

The following tables detail the wastewater workforce profile for the State of Colorado. The first table illustrates personnel at the state level.

TABLE XXIV

COLORADO DEPARTMENT OF HEALTH

Water Quality Control & Public Health Engineering Division
Wastewater Personnel
Current (1976) Staffing Level

Position	(a)	(b)	(c)	(d)	(e)	1976	%/annum turnover (average)
Administrative	0	0	0	0	0	3	0%
Engineer	5	6	4	1	3	19	2%
Training Officer	1	0	0	0	0	1	0%

TABLE XXIV

(continued)

Position	(a)	(b)	(c)	(d)	(e)	1976	%/annum turnover (average)
Biologist	0	0	0	2	0	2	*
Technician	0	0	0	7	0	7	2%
Secretarial	0	0	0	0	0	9	N/A
TOTAL	6	6	4	10	3	41	N/A

* unavailable
(a) Technical Services & Grants Section
(b) Field Services Section
(c) Monitoring & Enforcement Section
(d) Monitoring & Field Studies Section
(e) Water Quality Management Section

The following table depicts the number of certified wastewater operators in the State of Colorado as of this writing (January 1977).

TABLE XXV

COLORADO WASTEWATER TREATMENT PLANT PERSONNEL

Certified Operators
Current (1976) Staffing Level

Classification	1976	%/annum turnover (average)
A (highest)	154	40%
B	112	45%
C	309	50%
D (lowest)	403	50%
TOTAL	978	47%

The wastewater operator turnover rate has been estimated to be as high as 65%. The older operators are leaving the field through retirement and death. These same workers also advance to the supervisory level and have no further opportunity for upward mobility. At

that point, many leave the field for higher salaries in other occupational areas. The younger men are seeking upward mobility and salary increases and are even more apt to leave the field when their expectations are not met.

It should be noted that this 65% turnover rate is considered by comparison to be high. In the surrounding states, the turnover rate averages between 30% and 45%.

C. Workforce Projections

The following projected workforce requirements to 1982 are based on best professional judgements of representatives from the wastewater treatment field in Colorado.

The tables below reflect the projected workforce for wastewater personnel across the state. The projected requirements for the State Department of Health personnel are depicted in the following table.

TABLE XXVI

COLORADO DEPARTMENT OF HEALTH

Water Quality & Public Health Engineering Division
Wastewater Personnel
Workforce Projections to 1982 (est.)

Position	1976	1977	1978	1979	1980	1981	%/annum turnover (average)	%/annum growth (average)
Administrator	3	3	3	3	3	3	0%	0%
Engineer	19	19	20	20	20	20	2%	1%
Training Officer	1	1	2	2	2	2	0%	20%
Biologist	2	2	2	2	2	2	*	0%
Technician	7	7	7	8	8	8	2%	3%
Secretarial	9	9	9	10	10	10	N/A	2%
TOTAL	41	41	43	45	45	45	N/A	2%

* unavailable.

The following projections are for workforce requirements to 1982 for certified operators. These projections are based on best professional judgements.

TABLE XXVII

COLORADO WASTEWATER TREATMENT PLANT PERSONNEL

Certified Operators
Workforce Projections to 1982 (est.)

Class	1976	1977	1978	1979	1980	1981	%/annum turnover (average)	%/annum growth (average)
A	154	169	185	194	203	213	40%	7%
B	112	123	135	141	148	155	45%	7%
C	309	369	423	465	511	562	50%	13%
D	403	443	487	535	588	646	50%	10%
TOTAL	978	1104	1230	1335	1450	1576	47%	10%

These workforce requirements for water and wastewater are predicated on an increase in the operator salary scale (outside the Denver metropolitan area) and a stated need for upgrading of present personnel. The further development of the state's energy resources would also be a contributing factor relative to the increase in numbers of operators needed across the state.

D. Training and Certification

Colorado has been certifying operators for twenty years but has had mandatory certification only since 1973. The certification is pursuant to the authority of Article 9 of Title 25, C.R.S. 1973.

The operator of a plant must be certified in a class equal to or higher than the class of the plant. A supervising operator may not supervise more than one plant without a special authorization. There are also experiential requirements for the various classifications in addition to the successful completion of the certification exam. The certificates are valid for a period of five years, and certificates of an operator in good standing will be renewed upon written application without examination.

E. Career Potential

Career opportunities will be available for non-degreed personnel especially at the operator level. Department of Health personnel estimate that there will be increases in the number of wastewater treatment facilities. Firm figures are not available, however.

There are a number of skill areas and degreed positions that are presently accessible to those entering the field. Automation will certainly have its effect, but all indications point to a gradual expansion of the wastewater control field. Some areas requiring less than degree training are certified operators, mechanics, equipment operators, buildings and grounds, foreman, and laboratory technicians.

In the professional, usually degreed areas, there will be a continuing but gradual expansion of workforce requirements for individuals specializing in sciences and engineering such as micro/macro-biologists, chemists, engineers, system analysts, and administrative personnel.

The potential for careers in the field will depend to a large extent on fiscal commitment to future needs and to regulation which will establish standards for treatment facilities. The advent of increased strip mining activities will further effect the overall picture.

F. Conclusion

The need for water quality control in Colorado is stimulating the allocation of major efforts towards the most serious problems. Planning is critical to the success of the wastewater program. For the nine river basins of Colorado, the Division has drawn up plans relative to the location of treatment plants and the level of treatment required. The Division works cooperatively with local and regional planning agencies. In Colorado, extensive future planning is conducted in order to achieve the best alternative methods of water pollution control and abatement.

VIII. ENERGY

A. Introduction

The State of Colorado like other western states has an abundance of wide seamed, low sulpher coal. The largest contained oil shale area in the world, the Green River Formation, lies under Colorado, Utah, and Wyoming, and uranium deposits are substantial. According to the U.S. Bureau of Mines publication, Projects to Expand Fuel Sources in Western States, the following energy related projects are scheduled or are under development across the state: 45 coal mines, nine electric power plants, four waste to energy conversion plants, seven oil shale projects, two geothermal projects, two railroads, and one uranium mine. Energy resources in most forms are abundant across the State of Colorado. These resources result in vast economic benefits to various sectors of the population, while at the same time environmental disruptions may ensue. The pollution control and abatement activities relative to the development of energy resources is not a new undertaking within Colorado. While development of resources and protection of Colorado's natural resources seem to be divergent points of view, a spirit of conciliation and cooperation is evidenced within the state.

B. Workforce Profile

There are two major agencies with designated responsibilities in the area of state energy activities in Colorado.

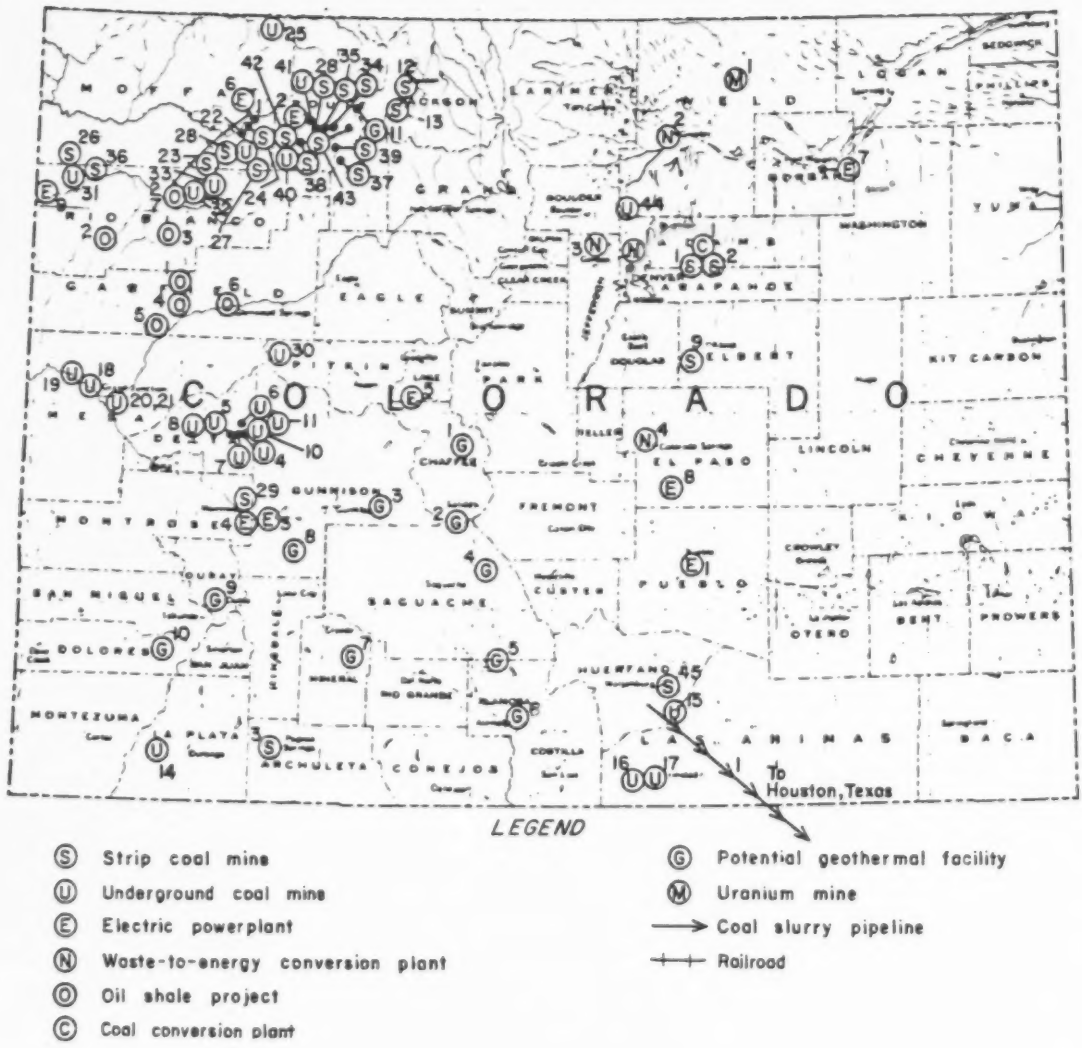


Figure 6 : FUELS RELATED PROJECTS IN COLORADO.

SOURCE: Bureau of Mines Information Circular #8718, Projects to Expand Fuel Sources in Western States, U. W. Department of the Interior, May, 1976.

The Governor's Energy Policy Council, appointed by the Governor, has as its major purpose the advisement of the Governor on matters related to the development of energy policies statewide. A State Energy Plan has been prepared and currently awaits approval by the Federal Energy Administration (FEA). Energy related problems in Colorado have been identified as including the following: conservation, the depletion of fossil fuels, alternative energy sources, mass transportation, and needs for changes in lifestyle and philosophy on the part of the citizenry regarding energy. The current staff of the Council is depicted in the following table.

TABLE XXVIII

STATE OF COLORADO

Governor's Energy Policy Council
Current (1976) Staffing Level

Position	1976	%/annum turnover (average)
Executive Director	1	0%
Energy Conservationist	1	0%
Energy Conservation Assistant	1	0%
Solar & Alternative Energy Source Specialist	2	0%
Fuel Allocation Officer	1	0%
Secretarial	1	N/A
TOTAL	7	N/A

The above table details the operational workforce of the Council. However, the following persons are included within the advisory membership of the Council:

- Commissioner of Agriculture;

- Director, Department of Natural Resources;
- Director, Department of Local Affairs;
- Governor's Coordinator of Natural Resources;
- Executive Assistant to the Governor;
- Governor's Coordinator for Socio-Economic Impact; and
- Vice President for Planning, Colorado School of Mines.

The Colorado Energy Research Institute (CERI), created by an Act of the Legislature in 1974, has the primary defined purpose of stimulating research in state of energy and energy related minerals, as well as the coordination of statewide technical and policy research among universities, state agencies, and the industrial sector.

The current workforce, which totals five, is depicted on the table below.

TABLE XXIX

COLORADO ENERGY RESEARCH INSTITUTE (CERI)

Current (1976) Staffing Level

Position	1976	%/annum turnover (average)
Director*	1	0%
Deputy Director for Technology*	1	0%
Deputy Director for Operations	**	100%
Research Administrator	1	0%
Secretarial	2	N/A
TOTAL	5	N/A

* part-time
** vacant for twelve months due to inadequate funding

C. Workforce Projections

Information regarding workforce projections as well as current workforce profiles was obtained by on-site interviews as well as telephone and mail surveys. Estimates regarding future workforce figures are a compilation of the professional judgements of experts in the energy areas in Colorado.

Projections for the staffing levels to 1982 of the Governor's Energy Policy Council were described as too speculative to advance at the present time. Currently the Council feels it is quite difficult to assess workforce increases or decreases in staffing levels. There have been indications by Council staff members, however, that a small increase of one professional position is likely over the next three to five years.

There is discussion within the state of a merger of this office with another state agency. The Department of Natural Resources has been cited as a possible alternative agency to which this staff might be assigned should a merger occur. The structure of the office may change and increased responsibilities and activities are strongly indicated for the future.

Personnel from the Colorado Energy Research Institute have stated that workforce projections to 1982 are difficult to determine. However, the following table details those possible staff increases.

TABLE XXX

COLORADO ENERGY RESEARCH INSTITUTE (CERI)

Workforce Projections to 1982 (est.)

Position	1976	1977	1978	1979	1980	1981	%/annum turnover (average)	%/annum growth (average)
Director[1]	1	1	1	1	1	1	0%	0%
Deputy Director for Technology[1]	1	1	1	2	2	3	0%	30%
Deputy Director for Operations[2]	1	1	1	2	2	2	100%	20%
Research Administrator	1	1	3	4	4	5	0%	52%
Secretarial	2	2	2	3	3	3	N/A	10%
TOTAL	6*	6	8	12	12	14	N/A	20%

[1] part-time;

[2] currently vacant;

* includes one presently vacant position.

The increases illustrated above are relative to specific occupational skills and levels of knowledge. Computer experts and general management expertise as well as technological competency are reported as the professional areas of need.

This institute is dependent upon state funding. Therefore, the entire staff could be out of work rather suddenly due to decreased allocations of funds. As energy conservation and development are such as major component of the State of Colorado's economic and sociological profile, it is highly unlikely that this organization will be completely abandoned at least in the near future.

D. Training and Certification

Training in the various areas of energy is demonstrated in several ways in Colorado. The Governor's Energy Policy Council has not been involved, to date, in presentations of educational information. No public workshops or seminars have been held. However, activities of this nature are written into the State Energy Plan. If the Plan is accepted by the Federal Energy Administration (FEA) seminars for industry as well as the public will commence by the end of 1977. The number and elaborateness of these offerings will be contingent upon funding.

The Colorado Energy Research Institute (CERI) is most actively involved with activities which interface with the public at large as well as specific specialists. The following table details these activities.

TABLE XXXI

STATE OF COLORADO

Energy Related Training
(partial listing)

SPONSOR	LENGTH	PROGRAM	NUMBER OF PARTICIPANTS
CERI	1 day	Conservation of Energy	General Public
CERI	1 day	Conservation of Energy	General Public
CERI	2 day	General Energy Technology & Conservation	General Public
CERI	4 day	Conservation of Home Energy	140

TABLE XXXI

(continued)

SPONSOR	LENGTH	PROGRAM	NUMBER OF PARTICIPANTS
Colorado State University	5 day	Solar Heating & Cooling of Residences	Building Contractors
Colorado State University	5 day	Solar Heating & Cooling of Residences	Architects, Engineers

Another activity which will directly intersect the public is the presentation of the draft of the State Energy Plan. This is a four-year conservation plan for the State of Colorado and has been complied not only through the efforts of the Governor's Energy Policy Council but also through the efforts of 300 citizens working on six committees. The major goal of the Plan is to reduce energy consumption in the state by five percent by 1980.

CERI scholarships for the 1976-1977 academic year numbered 108. These scholarships were awarded by CERI to students for study at the Colorado School of Mines, University of Southern Colorado, Mesa College, Western State College, Trinidad State Junior College, Northeastern Junior College, El Paso Community College, and Colorado Mountain College.

In addition, energy retraining fellowships were awarded to ten persons from Colorado who desired to seek entrance into the field of energy conservation and conversion.

E. Career Potential

Career potentials are vast and almost unlimited in representative areas of expertise. Career options should be available at the degreed level as well as the technician level.

Special training needs will have to be addressed. This has begun at several universities and colleges in Colorado. Mining, milling, and other extractive related skills,as well as energy conversion and conservation expertise will need an academic and/or training area.

Colorado may be the area where new and innovative career options are developed.

F. Conclusion

There are a great number of energy related activities which are scheduled for development for Colorado. Many of those projects mentioned in the introduction are self-explanatory. Several are unique and innovative in nature.

The two coal slurry pipelines, projected for the early 1980s, will be composed of approximately 820 miles of 24 inch pipeline stretching from Colorado to Texas. These pipelines are planned to cross railroads at 26 locations in Texas alone. Final determination of these two projects is dependent upon legislation relative to right of eminent domain.

There are four waste to energy conversion plants planned for Colorado which bear description.

The first planned project will utilize solid waste to gas as the type and feedstock. This project will consume 450 tons of solid waste per day and will be used for electrical generation.

The second project described will utilize rubber tires to oil and carbon black as the type and feedstock. From 11 million scrap tires, 14 million barrels of oil, and 63 million tons of carbon black will be produced annually.

The third planned project is described as bioconversion to methane. This project has been temporarily suspended but bears description. The conversion of feedlot wastes would result in production of methane. This process is known as bioconversion. Although this concept has been utilized in countries such as India for decades, the United States with an abundant energy supply found no utility for bioconversion until today. Today, bioconversion represents a possible means to lessening the country's dependence upon imported energy supplies.

The process is a natural decaying action that decomposes organic wastes and produces a low BTU natural gas, bio-gas, which may be refined into pipeline quality methane.

The fourth project is a solid waste to fuel oil project. The process utilized will be hydrogenation to produce heavy fuel oil from sewage sludge. Each ton of sewage will produce about 55 gallons of oil.

A further energy project development in Colorado involves wind. A demonstration project is currently being conducted by the U.S. Energy

Research and Development Administration (ERDA) at the Rocky Flats Plant (refer to Section VI, Solid Waste).

The University of Colorado has built a wind turbine which will be installed at the school's Institute for Arctic and Alpine Research (INSTAAR) located at 12,300 foot elevation. The Colorado Energy Research Institute is funding this project.

All of these energy conversion and conservation activities, as well as energy extraction projects, will require a skilled and technologically competent workforce. The future career potentials in the energy field in Colorado and most western states is quite unlimited. Future energy activities will present vast challenges to the state.

Selected Post Secondary Institutions
With Formal Environmental Energy Programs

In the State of Colorado there are several institutions which offer degrees in environmental programs. A larger number of higher education institutions offer environmentally related courses, which are not directed to a specific degree.

Colorado State University at Fort Collins presents an interdisciplinary studies program in general environmental studies. This program allows students to concentrate electives from a list of approved courses emphasizing environmental issues and alternative problem solutions. This program does not lead to a degree. The courses, however, can be used in meeting the requirements for a Bachelor's degree.

The University of Northern Colorado at Greeley historically has emphasized the preparation of students for careers in education. The University offers 31 hours of intensive environmental studies representing an interdisciplinary approach to complex environmental problems. The courses are utilized as electives to the general educational curriculum requirements.

Environmental education is well represented at Colorado's institutions of higher education. On the following pages, programs are presented in more detail from Adams State University and from the Community College of Denver at Red Rocks. These two institutions are presented as representative of environmentally related educational offerings in Colorado. It is not an exhaustive listing.

SENIOR INSTITUTIONS

Adams State College
Alamosa, Colorado

Program: Environmental Science (B.A., B.S.)

Hours required for major: Quarter - 60-70
Program Inception: 1972
Staff Size: Five professors, one associate professor, and one assistant professor (6 Ph.D., 1 M.S.)
Enrollment: 5-20
Graduates (1976): 3
Placement: 2
Graduate Work: 1

Courses

Air and Water Resources
Mineral and Energy Resources
Air Pollution Meteorology
Individual Studies
Pollution Effects
Topics in Environmental Science
Treatment of Data
Aquatic Biology
Environmental Effects on Health
Environmental Monitoring and Control
Scientific Data Presentation
Trace Analysis Techniques for Pollutants
Individual Study

COMMUNITY COLLEGES/TECHNICAL INSTITUTIONS

Community College of Denver - Red Rock Campus
Golden, Colorado

Program: Water/Wastewater Technology (A.S.)

Hours required for major: Quarter - 96-100
Program Inception: 1969
Staff Size: Two full-time instructors and two part-time instructors
Enrollment: 150 part-time students
Graduates (1976): 8
Placement: 3
Graduate Work (B.S.): 2

Courses

Introduction to Water-Wastewater
Water Sources and Supply
Mechanical Physical Treatment
Blueprint Reading for Water-Wastewater
Water Distribution
Sludge Treatment
Advanced Treatment
Wastewater Collection Systems
Water Distribution II
Hydraulics for Water-Wastewater
Specific Calculations for Wastewater
Water Treatment I, II
Biological Treatment
Water-Wastewater Equipment-Maintenance
Water-Wastewater Administration and Finance
Special Studies in Wastewater
Public Relations for Water-Wastewater
Instrumentation and Controls
Cooperative Work Experience
Independent Study

State Legislation

COLORADO AIR

TITLE:

Air Pollution Control Act of 1970
Colorado Statutes 25-7-101

PURPOSE:

To require the use of all available practical methods to reduce, prevent, and control air pollution throughout the state, and to maintain a cooperative program between state and local units of government.

DEFINITIONS:

1. Air contaminant
2. Air contamination source
3. Air pollution control authority
4. Ambient air
5. Commission
6. Division
7. Emission
8. Emission control regulation
9. Indirect air contamination
10. Local air pollution law
11. Motor vehicle
12. Person
13. Variance board

ADMINISTERING AUTHORITY:

Air Pollution Control Commission
Department of Health

AUTHORIZATIONS:

To develop a state air pollution control plan;
To adopt air quality standards and emission limitations;
To provide public information and make annual reports on air pollution;
To issue regulations pursuant to the act;
To conduct air pollution studies and research;

AUTHORIZATIONS (Cont'd)

To enter and inspect property in enforcement of the act;
To issue air pollution emergency orders;
To grant variances under the act;
To control motor vehicle emissions;
To act as the state lead agency in air pollution matters.

PROHIBITED ACTS:

To violate any air quality or emission limitation standards;
To fail to abide by emergency and other orders;
To violate any other regulations or act provisions.

PENALTIES:

Air emission notice violation - fines of up to $100;
General violations - fines of up to $2,500.

COLORADO NOISE

TITLE:

Noise Abatement Law
Colorado Statutes 66-35-1

PURPOSE:

To prevent adverse physiological and psychological effects of noise on human beings and to establish maximum permissible noise level emissions.

DEFINITIONS:

1. Decibel
2. dbA
3. Residential zone
4. Commerical zone
5. Light industrial zone
6. Industrial zone

ADMINISTERING AUTHORITY:

Local Governmental Units
All Citizens of the State

AUTHORIZATIONS:

To maintain civil actions to prevent and abate noise pollution;
To adopt ordinances prohibiting excessive noise from motor vehicles;
To generally enforce the noise limitations set forth in the act.

PROHIBITED ACTS:

To violate act provisions dealing with zone and time of day noise limitations;
To sell or offer for sell any motor vehicle not in requirement with maximum noise limitations;
To violate any other provisions of the act.

PENALTIES:

General violations - fines of from $100 to $2,000;
Motor vehicle sale violation - fines of from $50 to $300.

COLORADO PESTICIDES

TITLE:

Commercial Pesticide Applicators Act
Colorado Statutes 35-10-101

PURPOSE:

To control the use of pesticides, and to provide for the certification of pesticide applicators.

DEFINITIONS:

1. Advertise
2. Agent
3. Agricultural applicator
4. Agricultural pest
5. Applicant
6. Applicator
7. Body politic
8. Cert. of registration
9. Commercial applicator
10. Commission
11. Commissioner
12. Defoliant
13. Department
14. Dessicant
15. Device
16. Equipment
17. Fungi
18. Fungicide
19. Herbicide
20. Insecticide
21. Insects
22. Licensee
23. Nematode
24. Nematocide
25. Ornamental applicator
26. Ornamental pest
27. Person
28. Pesticide
29. Plant regulator
30. Qualified applicator
31. Stop work order
32. Structural pest control
33. Weed

ADMINISTERING AUTHORITY:

Department of Agriculture
Pesticide Advisory Committee

AUTHORIZATIONS:

To issue regulations pursuant to the act;
To enforce provisions of the act;
To enter and inspect property in enforcement of the act;
To classify pesticides and restrict their use;
To regulate storage transportation and disposal of pesticides;
To license pesticide dealers;
To establish pesticide certification standards;
To certify pesticide applicators.

CERTIFICATION OR LICENSING:

Dealers of restricted use pesticides must be licensed;
All commercial applicators of restricted use pesticides must be certified;
Oral and written examination required for the categories of agricultural applicator and ornamental applicator.

PROHIBITED ACTS:

To act as a pesticide dealer without a license;
To apply pesticides commercially without proper certification;
To apply restricted pesticides without a permit.

EXEMPTIONS:

Person applying pesticides on own or controlled property;
Occasional applicators;
Applicators of fertilizer and soil conditioners;
Structural pest control persons.

PENALTIES:

Fines of from $100 to $1,000.

COLORADO POTABLE WATER/WASTE WATER

TITLE:

Water and Waste Water Treatment Plant Operators Law
Colorado Statutes 25-9-101

PURPOSE:

To assure adequate operation of water and waste water treatment facilities and to provide for the certification of water and waste water treatment facility operators.

DEFINITIONS:

1. Board
2. Certification
3. Certified operator
4. Department
5. Waste water treatment plant
6. Water supply system
7. Water treatment plant

ADMINISTERING AUTHORITY:

Department of Health
Plant Operators Certification Board

AUTHORIZATIONS:

To issue regulations establishing treatment facility classifications and certification standards;
To assist in regular operator training school programs;
To establish a formal certification procedure for operators.

CERTIFICATION OR LICENSING:

All water and waste water treatment plant operators must be certified in a class corresponding to the facility classification, all as established by the Board;
Certification is issued upon examination or without examination for prior operators.

PROHIBITED ACTS:

To allow the operation of a water or waste water treatment plant without a properly certified operator;
To perform the duties of a certified operator without proper certification.

PENALTIES:

Fines of up to $300.

COLORADO RADIATION

TITLE:

Radiation Control Law
Colorado Statutes 25-11-101

PURPOSE:

To provide for the comprehensive control of sources of ionizing radiation and the control of radioactive materials.

DEFINITIONS:

1. Department
2. Ionizing radiation
3. Radioactive material

ADMINISTERING AUTHORITY:

Department of Health
Radiation Advisory Committee

AUTHORIZATIONS:

To act as the state lead agency in radiation matters;
To issue regulations pursuant to the act;
To enter into agreements with other state and federal agencies;
To license or register sources of ionizing radiation or radioactive materials;
To generally provide for the safe use of radiation sources.

PROHIBITED ACTS:

To own, possess or acquire any radioactive material without proper license;
To use, manufacture or possess sources of ionizing radiation without proper registration.

EXEMPTIONS:

Non-dangerous sources of radiation;
Radiation machines in the process of manufacture;
Radioactive materials in transportation;
Sound and radio waves.

PENALTIES:

Fines of from $100 to $500 or from 30 days to 90 days imprisonment.

NRC AGREEMENT STATE: Yes

COLORADO SOLID WASTE

TITLE:

Solid Wastes Disposal Sites and Facilities Law
Colorado Statutes 30-20-101

PURPOSE:

To provide for the control of solid waste transportation and disposal, and for the operation of solid waste disposal sites and facilities.

DEFINITIONS:

1. Approved site of facility
2. Department
3. Person
4. Recyclable
5. Recycling operation
6. Solid wastes
7. Solid wastes disposal
8. Solid wastes disposal site and facility
9. Transfer station

ADMINISTERING AUTHORITY:

Department of Health
County Commissions

AUTHORIZATIONS:

To issue certificates for solid waste sites and facilities;
To issue regulations pursuant to the act;
To establish solid waste site and facility standards;
To provide technical assistance to solid waste facilities.

PROHIBITED ACTS:

To operate a solid waste disposal site or facility without proper certification;
To dispose of solid waste other than at a solid waste site or facility;

PROHIBITED ACTS (Cont'd):

To dispose of radioactive materials at a general solid waste site.

EXEMPTIONS:

Disposal of own solid waste on own property.

PENALTIES:

Fines of up to $100 or 30 days imprisonment.

COLORADO WASTE WATER

TITLE:

Water Quality Control Act
Colorado Statutes 25-8-101

PURPOSE:

To provide for water pollution control and abatement and to conserve the waters of the state to protect, maintain and improve the public health.

DEFINITIONS:

1. Commission
2. Control regulation
3. Division
4. Effluent limitation
5. Federal Act
6. Individual sewage disposal system
7. Municipality
8. Permit
9. Person
10. Point source
11. Pollutant
12. Pollution
13. Promulgate
14. Schedule of compliance
15. Sewage treatment works
16. State waters
17. Water quality standard

ADMINISTERING AUTHORITY:

Water Quality Commission
Department of Health

AUTHORIZATIONS:

To develop a comprehensive plan for the prevention, control and abatement of water pollution;
To classify waters of the state;
To establish water quality standards;
To issue regulations pursuant to the act;
To administer the state water discharge permit program;

AUTHORIZATIONS (Cont'd):

To review and approve construction and operation plans of individual sewage disposal systems;
To administer federal funds and act as the state lead agency in water pollution matters;
To generally enforce all provisions of the act;
To monitor waste water discharges in the state;
To enter and inspect property in enforcement of the act;
To conduct studies and investigations relating to water pollution and control;
To establish and conduct the continuing planning process for waste treatment management;
To perform such other duties as required to carry out the purposes of the act.

PROHIBITED ACTS:

To discharge any pollutant into state waters without a proper permit;
To violate the terms of any permit;
To discharge or dispose of any radioactive, toxic, or other hazardous waste into the state's waters;
To cause or allow water pollution from agricultural wastes;
To make any false statement or representation under the act;
To construct or expand any sewage treatment facility without prior approval;
To violate any order issued pursuant to the act or any other provision of the act.

PENALTIES:

Permit violations - fines of up to $10,000 and $10,000 per day;
Criminal fines for water pollution violations - negligent violations result in fine of up to $12,500;
Intentional violations result in fine of up to $25,000.